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REPORT RESUMES

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THE INFLUENCE OF VERBAL STATEMENTS UPON THE PERFORMANCE OF MENTALLY RETARDED CHILDREN.

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THE INFLUENCE OF PERFORMANCE EXPECTATIONS VERBALLY EXPRESSED BY AN AUTHORITY FIGURE AND THE MANIFEST ANXIETY OF THE SUBJECT ON SIMPLE AND COMPLEX LEARNING TASKS WAS STUDIED IN RELATION TO MENTALLY RETARDED CHILDREN. THE HYPOTHESES TESTED WERE THAT THERE WILL BE NO DIFFERENCE IN PERFORMANCE ON THE EXPERIMENTAL TASKS AS A FUNCTION OF THE (1) VERBAL STATEMENTS OF PERFORMANCE EXPECTATIONS, (2) MANIFEST ANXIETY LEVEL OF THE SUBJECT, (3) SEX OF THE SUBJECT, (4) COMPLEXITY OF THE TASKS, AND (5) INTERACTIONS OF THE VARIABLES. SUBJECTS WERE RANDOMLY ASSIGNED TO 12 EXPERIMENTAL GROUPS WHICH WERE TESTED USING TASKS REPRESENTING DIFFERENT TYPES OF LEARNING AND DEGREES OF DIFFICULTY. THE CONCLUSIONS REACHED WERE (1) THAT EFFECTS OF THE VERBALLY EXPRESSED EXPECTATIONS ON THE PERFORMANCE OF THE RETARDED CHILD ON EXPERIMENTAL TASKS MAY HAVE BEEN RELATED TO THE SEX OF THE CHILD, AND (2) THAT MEAGER EVIDENCE WAS FOUND TO SUGGEST THAT ANXIETY LEVEL MAY ALSO BE A RELATED FACTOR. FURTHER INVESTIGATIONS OF THE VARIABLES EMPLOYING IMPROVED DESIGNS AND PROCEDURES WERE ENCOURAGED. (AL)

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THE INFLUENCE OF VERBAL STATEMENTS UPON THE PERFORMANCE OF MENTALLY RETARDED CHILDREN

Cooperative Research Project No. S-162

Richard K. Myers, Ed. D.
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University of Pittsburgh
Pittsburgh, Pennsylvania
Beaver County Public Schools
Beaver, Pennsylvania

1965

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FOREWORD

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I. INTRODUCTION

A. Introduction to the Problem

One widely practiced organizational procedure for teaching an educable mentally retarded child has been to place the child in a special class with other children similarly classified. That the special class has been accepted by educators as the solution to the educational problems of retarded children is attested to by the widespread prevalence of such special classes. Implicit in this development has been the general acceptance of the notion that mentally retarded children will benefit more from placement in a special class than by remaining in regular graded classes.

Complete acceptance of the special class as the major solution to the education of retarded children is also reflected in the attitudes of professional workers associated with program planning and teacher training (Gardner and Nisonger, 1962, pp. 120-124; Hodgson, 1964, pp. 196-201). Cruickshank (1960, p. 83) states that: "Undoubtedly, the arrow points to the special class as the most satisfactory method of educational administrative planning for this [mentally retarded] population." The almost unquestioned acceptance of the special class by professional educators probably accounts for the President's Panel on Mental Retardation (1962, p. 101) presenting the view that: "There can no longer be doubt as to the need for, and desirability of, special classes for education of the mentally retarded." However, the advantages of the special class are based primarily upon subjective judgment (Johnson, 1962, pp. 62-63; Sparks and Blackman, 1965, p. 242).

Recently, the efficacy attributed to the special class for educable mentally retarded children has been under scrutiny. Johnson (1962, pp. 62-65), in a review of comparative and follow-up studies of retarded children attending special classes and/or regular classes, reported that research evidence failed to substantiate the efficiency of the special class. Johnson (1962, p. 66) concluded that:

> From the studies cited, there is almost universal agreement that the mentally handicapped children enrolled in special classes achieve, academically, significantly less than similar children who remain in the regular grades. In the area of motor or manual skills, there appears to be no difference in their development. The results related to personal and social development are not in complete agreement. If the special class groups have any advantage over the regular class groups, it appears to be slight and probably not particularly meaningful.

Similar conclusions have been reported by other investigators. Quay, in an extensive review of comparative and follow-up studies, summarized by stating: "The most that can be said for studies on placement [special class versus regular class] is that the results are inconclusive" (Quay, 1963, p. 672). Sparks and Blackman (1965, p. 246), following their review of studies, concluded by stating:

> There is increasing emphasis on special class placement of educable mentally retarded children and special preparation for teachers. At the same time an analysis of available evidence continues to point toward the lack of superior academic achievement and to cause some questioning of the superiority of the social environment provided by the special classes.

The uncertain effectiveness of the special class raises serious questions related to appropriate educational programs for educable mentally retarded children. Johnson (1962, p. 66) has summarized the current situation:

> It is indeed paradoxical that mentally handicapped children having teachers especially trained, having more money (per capita) spent on their education, and being enrolled in classes with fewer children and a program designed to provide for their unique needs, should be accomplishing the objectives of their education at the same or at a lower level than similar mentally handicapped children who have not had these advantages and have been forced to remain in the regular grades.

Johnson (1962, pp. 67-69) has offered an explanation of and proposed a remedy for the reported "paradox" of the special class. He suggests that the limited efficacy of the special class may be a function of (a) a reduction in anxiety level of children in the special class resulting from (b) a reduction of the stress (drive to learn, achieve or perform) created by realistic demands (to learn, achieve or perform) on the part of the teacher. Johnson suggests that the reduction in anxiety level resulting from the reduction of realistic stress will be reflected in decreased learning. Johnson's explanation is based upon Hull-Spence learning theory (Spence, 1958, pp. 131-141). This theory states that anxiety level contributes to drive level and facilitates or interferes with learning in specific situations. One such situation is related to anxiety arousal. Under conditions of anxiety arousal, highly anxious children would be expected to have increased drive strength when compared to low anxious children (Taylor, 1956, pp. 303-320). Johnson views the special class as a situation in which, " . . . the pressures for learning and achieving have often been largely removed so that the child has no need to progress" (Johnson, 1962, p. 68).

The substantial investment of financial and professional resources in maintaining and promoting the special class for retarded children has yet to be justified. Sparks and Blackman (1965, p. 244) have summarized the problem:

> In view of the inconclusiveness of the research, the critical issue of whether we should continue to schedule special classes, with the accompanying increased costs as a result of reduced class sizes, special equipment and materials, special salary increments and the additional training required of teachers, remains unresolvable.

It remains for the efficacy ascribed to the special class to be isolated and demonstrated. If Johnson's rationale is accepted, the solution to the apparent inefficacy of the special class may be to create appropriate stress levels in the special class situation so that the mentally retarded child responds with a reciprocal motivation required for learning.

A number of questions relating to the effects of anxiety and demands for performance need to be posited. What are the effects of anxiety level on the performance of mentally retarded children on selected learning tasks? What are the effects of verbal statements of expectation on the performance of mentally retarded children on selected learning tasks? Do male and female retarded children react in the same way to their performance expectations?

The continuing emphasis on providing appropriate educational activities for educable mentally retarded children increases the need to understand the variables influencing the learning process in retarded children. An understanding of the facilitating and/or interfering qualities of the variables influencing the learning process may enable educators to improve the educational process by which educational objectives are achieved.

This study was designed to investigate the influence of anxiety level and performance expectations on the learning behavior of educable mentally retarded children. Performance expectation is an externally imposed level of performance on a specific learning task. It is reasonable to assume that increased understanding of the effects of anxiety level and performance expectations should contribute to the teaching-learning process and should provide a partial answer to the "paradox" of the special class.

B. Statement of the Problem

This study will investigate the influence of verbally mediated statements of performance expectations delivered by an authority figure on the performance of educable mentally retarded children of high and low manifest anxiety on three selected learning tasks.

C. Elements of the Problem

The conclusions of related investigations suggested a number of questions related to the influence of performance expectations and manifest anxiety on the performance of educable mentally retarded children on simple and complex learning tasks. Specifically, this investigation was designed to answer the following questions:

(A) Are there differences in performance on the experimental tasks related to the type of verbal demands for performance delivered by an authority figure?

(B) Are there differences in performance on the experimental tasks related to the manifest anxiety level of the subject?

(C) Are there differences in performance on the experimental tasks related to the sex of the subject?

(D) Are there differences in performance on the experimental tasks related to the complexity of the learning tasks?

(E) Are there differences in performance on the experimental tasks related to the interaction of one or more of the independent variables?

D. Hypotheses Under Investigation

The specific null hypotheses to be tested were as follows:

(A) There will be no difference in performance on the experimental tasks as a function of the verbal statements of performance expectations delivered by an authority figure.

(B) There will be no difference in performance on the experimental tasks as a function of the manifest anxiety level of the subject.

(C) There will be no difference in performance on the experimental tasks as a function of the sex of the subject.

(D) There will be no difference in performance on the experimental tasks as a function of the complexity of the task.

(E) There will be no difference in performance on the experimental tasks as a function of the interactions among manifest anxiety level, verbal statements of performance expectations delivered by an authority figure, and the sex of the subject.

All statistical tests of significance were based on the .05 level, [redacted]. Tacit support to the use of a significance level of .05 has been given by Edwards (1954, p. 241) who noted that it is frequently used by researchers.

E. Definition of Terms

1. Educable Mentally Retarded (EMR)

The educable mentally retarded are children with intelligence quotients of 50-79 points as determined through use of an individual intelligence test administered by a certified public school psychologist.

2. Motor and Sensory Dysfunctions

Motor and sensory dysfunctions are visual, auditory, or neurophysiological deficiencies identified during routine school medical examinations and reported on school health records or identified by community resources and reported to the school.

3. Emotional Disturbances

Emotional disturbances are identifiable behavioral problems diagnosed by community mental health resources and reported on school health records or in cummulative folders.

4. Manifest Anxiety

Manifest anxiety is a score obtained on the A scale of the Children's Manifest Anxiety Scale (CMAS) administered orally to educable mentally retarded children.

5. Performance Expectation

Performance expectation is the level of performance anticipated on a specific learning task and communicated to the EMR child through encouraging or discouraging verbal comments delivered by an authority figure.

6. Encouraging Verbal Treatment (E)

The encouraging verbal treatment consisted of ten verbal comments designed to produce an expectancy of success (ES) delivered by the examiner according to a predetermined random sequence at regularly determined intervals. The following four verbal statements, designated ES-1, were presented to the subject during the period of instruction and prior to the learning trials:

(a) This will not be too hard for you.

(b) You should do very well on this.

(c) I expect you to do well on this.

(d) You won't find this too hard.

The following six verbal statements, designated ES-2, were delivered during the inter-trial rest periods:

(e) You are doing fine but I want you to do better this next time.

(f) Very good but let's work harder this next time.

(g) Fine but I think you can do better this next time.

(h) You are doing well but let's do better this next time.

(i) That's very good but I think you can improve this next time.

(j) You are really good at this but I expect you to be even better this next time.

7. Discouraging Verbal Treatment (D)

The discouraging verbal treatment consisted of ten verbal comments designed to produce an expectancy of failure (EF) delivered by the examiner according to a predetermined random sequence at regularly determined intervals. The following four verbal statements, designated EF-1, were delivered during the period of instructions and prior to the learning trials:

(a) You probably will find this too hard for you.
(b) I know this will be hard for you.
(c) I do not expect you to do too well on this.
(d) You will not do very well on this.

The following six verbal statements, designated EF-2, were delivered during the inter-trial rest periods:

(e) You are doing about as well as can be expected.
(f) I know this is hard for you.
(g) I didn't expect you to be very good at this.
(h) I know you are doing as well as you can.
(i) I know this is probably too hard for you.
(j) I know you are working as hard as you can.

8. Neutral Treatment (N)

The neutral treatment consisted of the simple attention of the examiner without verbal comment designed to establish an expectancy (EN) of neither success nor failure.

F. Related Research

The influence of manifest anxiety and performance expectations has been the subject of considerable scientific interest. However, few investigators have attempted to study the combined influence of the two variables with the same subjects. No research has been found in a survey of the literature that investigated the combined influence of manifest anxiety and verbal statements of performance expectations on learning employing male and female educable mentally retarded subjects. The research related to the influence of manifest anxiety and performance expectations on learning will be reviewed separately for each variable.

1. Manifest Anxiety

Spence (1958, pp. 133-140) has reviewed and summarized the results of research focusing on the influence of manifest anxiety on various types of learning tasks. The studies reported by Spence were conceived within the theoretical schema provided by Hullian learning theory.[1] Much of the research reported by Spence employed a paper and pencil manifest anxiety scale (TMAS) developed by Taylor (1953, pp. 285-290) and was assumed to be a measure of emotional response contributing to generalized drive. Employing the Taylor scale, the proponents of the Hull-Spence schema initially viewed a high score as indicative of a high level of generalized drive and predicted that subjects scoring high on the scale would be superior on a learning task to subjects scoring low on the scale.

Spence's summary of researches involving simple classical conditioning found results consistent with the theoretical formulation although not always statistically significant. Studies involving complex human learning, however, have not produced consistent results. The failure to obtain consistent results with both simple and complex learning resulted in an elaboration of Hull's basic formulations to include the number of competing response tendencies evoked in a given learning situation. The elaboration has been presented by Taylor (1956, p. 304) who stated:

---

[1] Hull's basic assumption states that E (excitatory potential) determines the strength of a response. E is a multiplicative function of H (a learning factor) and D (a generalized drive factor). According to Hull, R (an index of learning) = $f(E) = f(H \times D)$.

> In situations in which a number of competing response tendencies are evoked, only one of which is correct, the relative performance of high and low drive groups will depend upon the number and comparative strengths of the various response tendencies. . . . When the correct response is weaker (i.e., has less H) than one or more of the competing response tendencies, high-drive groups should be inferior in performance to low-drive Ss. . . . As the strength of the correct tendency increases relative to the incorrect, high-drive groups should become less inferior and eventually superior in performance to low-drive groups.

The facilitating effect of high anxiety was subsequently restricted to simple learning situations involving a minimum of competing response alternatives.

The research reported by Spence provided considerable support for the altered prediction that high anxiety would facilitate learning on simple tasks involving a minimum of competing response alternatives. Conversely, the prediction that low anxiety would facilitate learning on complex tasks involving a number of competing response alternatives has not been consistently supported. Two alternate sub-hypotheses have been suggested by Taylor (1956, p. 306) to account for the failure to obtain consistent results. One, subjects who score high on the manifest anxiety scale react emotionally in a persistent manner to all situations, whether stressful or not. Two, subjects who score high on the anxiety scale have a lower threshold of emotional responsiveness and react with an emotional response only in situations containing some degree of stress.

The application of the theoretical formulation to retarded children was facilitated by the development of a children's form of the manifest anxiety scale (CMAS), (Castaneda, McCandless, and Palermo, 1956, pp. 317-326). The subsequent research usually has consisted of either investigating the correlation between the CMAS and academic achievement, or selecting groups from the extremes of the distribution of CMAS scores and comparing the groups on an index of learning. Employing the CMAS with normal children, anxiety has been found to influence learning. The correlational studies have consistently found a small, negative, but statistically significant from zero, relationship between the CMAS and various measures of school achievement. High anxiety appears to be inversely related to achievement (McCandless and Castaneda, 1956, pp. 379-382; Broen, 1959, pp. 701-704; Reese, 1961, pp. 132-135; Keller and Rowley, 1962, pp. 19-22). Studies employing high and low anxiety groups have found the low CMAS group to have significantly higher academic achievement than the high CMAS group (Phillips, 1962, pp. 316-322); and low CMAS groups to be significantly superior to high CMAS groups on complex learning tasks (Castaneda, Palermo, and McCandless, 1956, pp. 327-332; Palermo, Castaneda, and McCandless, 1956, pp. 333-337). The facilitating effect of anxiety on tasks involving few response alternatives has not been confirmed. Four of the studies reported a stronger negative relationship for girls than for boys. When the variable of school grade was explored, the results obtained were inconsistent.

Attempts have been made to compare the scores obtained on the CMAS by educable mentally retarded children with scores obtained by average children of the same CA and MA (Malpass, Mark, and Palermo, 1960, pp. 305-308; Carrier, Orton, and Malpass, 1962, pp. 271-274; Cochran and Cleland, 1963, pp. 539-542). In the three studies reported, retarded children were found to obtain significantly higher scores on the CMAS than children with average intelligence.

Studies investigating the influence of anxiety on learning employing retarded children have reported similar results to that obtained with normal subjects. Hall (1959, pp. 36-37), in a study of learning set formation, found a significant (.05 level) rank order coefficient of correlation of .36 between the CMAS and total error scores on an object-quality discrimination learning task. The task, presented to 26 educable mentally retarded children enrolled in special classes, was a relatively complex task involving many competing stimulus-response associations. Hall's study indicated that high CMAS scores interfered with learning set performance. Similar results have been reported by Lipman and Griffith (1960, pp. 342-348) who presented a concept formation task to 115 institutionalized retarded subjects. The subjects were required to report similarities within three- and six-word sets. A significant (.01 level) partial correlation coefficient (IQ removed) of -.55 was obtained between the CMAS and total concept formation score. Sex and age were not related to scores on either the CMAS or concept formation. Following an elaboration of their experimental design to compare high and low anxiety groups controlled for IQ, the authors concluded that while the results supported the prediction of a debilitating effect for high anxiety on tasks involving a number of competing response alternatives, the results failed to find a facilitating effect for high anxiety when the tasks involved few competing response alternatives. On the other hand, Feldhusen and Klausmeier (1962, pp. 403-409) found the results inconclusive when they administered both the CMAS and the California Achievement Battery, Primary Form to 40 mentally retarded children. Although all the correlation coefficients between the CMAS and achievement scores were negative, only the relationship between the CMAS and arithmetic (-.49) was statistically significant from zero.

The studies reported employing the CMAS with mentally retarded children have provided results partially consistent with predictions derived from the Hull-Spence theoretical formulation. However, other studies have failed to find consistent results.

Cantor (1963, pp. 127-129) reviewed and summarized studies focusing on the influence of anxiety on learning using retarded subjects. Although his review failed to find conclusive results, Cantor (1963, p. 128) concluded by stating:

> The formulation regarding the role of anxiety as drive would thus appear to merit serious attention in regard to the learning

> of defective individuals. The possibility that high anxiety interferes with learning in defectives carries implications of considerable practical significance.

Steigman (1962, pp. 70-72), following a review of the same literature, suggested that the failure to find consistent evidence supporting the theoretical formulation may be due to retarded children experiencing tasks as more complex than do children of high intelligence. Steigman (1962, p. 72) hypothezised that;

> . . . in a given learning situation a mental retardate has a greater tendency to behave in the manner of an individual attempting to learn a complex task under conditions of heightened drive. This condition has been found experimentally to be nonfacilitative with respect to learning in normal subjects.

On the basis of the available evidence, anxiety as measured by the CMAS appears to be related to learning. However, conclusive evidence is not available to explain either the complex relationship between anxiety and learning or to accept the Hull-Spence theoretical formulation upon which much of the research was based. It would appear, moreover, that the majority of the research on the influence of anxiety and learning in children has been conducted with the assumption that scores obtained on the CMAS represent a chronic emotional state. The alternative assumption, that the CMAS score represents a threshold of emotional responsiveness and influences learning only in situations containing some degree of stress, has not been systematically tested.

2. Performance Expectations

Cromwell (1963, pp. 41-91) reviewed and summarized a series of studies employing mentally retarded subjects that have implications for the assumptions underlying the use of verbal statements of performance expectations stated by an authority figure as a major independent variable of this study. The majority of the studies reported by Cromwell were designed to test various hypotheses developed from a basic postulate of social learning theory: "The occurrence of a behavior of a person is determined not only by the nature or importance of goals or reinforcements but also by the person's anticipation or expectancy that these goals will occur" (Rotter, 1954, p. 102). Within social learning theory, expectancy is defined as the, " . . . subjective probability held by the individual that a particular reinforcement will occur as a function of, or in relation to, a specific behavior in a given situation or situations" (Rotter, 1954, p. 107).

Of the studies reported by Cromwell (1963, pp. 41-91) employing educable mentally retarded children as subjects, the following assumption is posited: the average retardate has a lower generalized expectancy for success and a higher avoidance tendency than the average normal subject. Generalized expectancy is that ". . . component of expectancy which develops as a function of the individual's successes and failures in past situations in his life and which generalizes into the present situation" (Cromwell, 1959, p. 333). It follows from the Rotter-Cromwell conceptualization that the retarded child, with a lower generalized expectancy for success and a higher avoidance tendency, has an increased likelihood of further failure which tends to create a cyclic effect, i.e., failure further reduced the generalized expectancy for success and increases the avoidance tendency producing increased likelihood of additional failure. In a novel situation, the retarded child lacks the previous experience upon which to develop a situational expectancy, hence, his initial performance is related to generalized expectancy developed as a result of prior experiences in a variety of situations. Subsequent experiences of success or failure in a novel situation provide the basis for a performance expectancy in a specific situation accompanied by a corresponding weakening of the predictive value of the generalized expectancy.

Cromwell's (1963, p. 87) review of studies designed to test the assumptions upon which the constructs of expectancy and generalized expectancy were based, provided evidence supporting the following adapted summary statements:

(a) The retarded subject enters a novel situation with a performance level which is depressed below his level of constitutional ability.

(b) The retarded subject has less tendency than the normal subject to increase effort following a mild failure.

(c) The retarded subject has less tendency than the normal subject to be "moved" by failure experiences.

Cromwell's summary statements, based upon available literature, provide preliminary support to the assumption that the average retarded child has a lower generalized expectancy for success and a higher avoidance tendency than the average nonretarded child. Preliminary support also exists to indicate that failure produces the predicted cyclic effect.

Other studies based on the Rotter-Cromwell theoretical construct employing normal subjects have implications for the present study. Aronson and Carlsmith (1962, pp. 178-182) and Ward and Sandvold (1963, pp. 293-295) attempted to study the effects of inconsistencies between actual performance level and performance expectations. Aronson and Carlsmith (1962, pp. 178-182) found subjects whose performances were inconsistent with their expectations, altered their responses significantly more often than subjects whose performances were consistent with their expectations. The altering of responses as an attempt to reduce inconsistencies occurred as frequently for those subjects whose performances were above expectations as for those whose performances were below expectations. Ward and Sandvold (1963, pp. 293-295) modified the design of the Aronson and Carlsmith study but failed to confirm their results.

Tyler (1958, pp. 166-172) investigated the effects of verbal instructions in establishing situational expectancies for success and failure on a difficult novel task. Employing verbal statements designated "encouragement," "discouragement," and "combination," the results of the study supported Tyler's hypothesis that: "Differential performance results from establishing a 'situational' expectancy for eventual success or failure which in turn influences an individual's performance in a problem solving situation" (Tyler, 1958, p. 171).

In summary, current literature suggests that a situational expectancy can be established through the use of verbal instructions and that the expectancy thus established influences performance. Since evidence also exists to indicate that the retarded child's initial performance is influenced by a low generalized expectancy for success it follows that specific attempts to increase situational expectancy through verbally manipulated instructions should result in improved performance. If verbal instructions modify situational expectancy and performance, an understanding of this phenomenon has implications for the teacher's use of oral statements for education.

3. Manifest Anxiety and Instructions

Studies have been reported that indirectly investigated the combined influence of expectancy and anxiety on learning. Sarason, Mandler, and Craighill (1952, pp. 561-565) studied the effects of different sets of verbal instructions on the subsequent learning of nonretarded subjects differing in measured anxiety. One half of the subjects were told they would be expected to complete the task in the time allotted, the other half were told they were not expected to finish. The authors reported that the low anxiety subjects who had received instructions that they would be expected to complete the task in the allotted time were significantly superior on a modified Wechsler-Bellevue Digit Symbol task than the other groups employed in the design. Sarason (1961, pp. 165-168) instructed one group of nonretarded subjects that a series of difficult anagrams could be easily solved (personal threat condition) and told a second group that the anagrams were quite difficult and that the successful solution of all of them in the allotted time was highly unlikely. The subjects were divided into high, middle, and low anxiety groups on the basis of scores obtained from several anxiety scales. The author reported that only the interaction between anxiety and instructions was statistically significant. Both middle and low anxiety groups performed at a higher level than the high anxiety group when instructed that the anagrams could be easily solved, however, just the opposite occurred under the other instructional condition.

Both studies employed tasks that were difficult, hence the subjects who received instructions designed to create a positive expectation of success were assumed to be under conditions that increased the stressfulness of the situation. On the basis of the Hull-Spence theoretical formulation, such a condition would be predicted to interfere with the performance of high anxiety subjects when compared to low anxiety subjects and facilitate the performance of low anxiety subjects when compared to high anxiety subjects on tasks containing competing response tendencies. The opposite predictions would be made for performance on simple tasks with only one response tendency. The results of the two studies reported provide partial evidence supporting the theoretical predictions. Sarason (1962, pp. 23-33) has reviewed and summarized a series of studies in which verbal instructions have been employed to increase the stressfullness of the situation. Although the majority of the studies employed nonretarded adult subjects and employed "ego threatening" instructions, Sarason concluded by stating, ". . . the bulk of the available findings suggest that high anxious Ss are affected more detrimentally by motivating conditions or failure reports than are Ss lower in the anxiety score distribution." (Sarason, 1962, p. 25).

4. Summary of Related Research

The reviewed research related to the influence of verbal statements of performance expectations issued by an authority figure and manifest anxiety on learning suggests the following generalizations:

(a) A situational expectancy can be established through verbal instructions.

(b) An established situational expectancy influences performance.

(c) Retarded children enter a novel situation with a low generalized expectancy for success.

(d) While manifest anxiety appears to influence learning, the influence is complex, lacking in consistency, and is apparently a function of the complexity of the task.

(e) Verbal instructions employed to create an "anxiety-laden" situation interfere more with the performance of high anxiety subjects than with the performance of low anxiety subjects.

Johnson's (1962, pp. 67-69) hypothesis that (a) a reduction in anxiety level resulting from (b) a reduction or elimination of the pressures (stress) created by realistic demands for performance (c) results in a reduction in learning appears to rest upon two assumptions: (1) anxiety influences learning only in situations consisting of some degree of stress and (2) demands for performance create just such a situation. On the basis of available research, Johnson's first assumption is consistent with the Hull-Spence theoretical formulation in those situations involving simple learning tasks and inconsistent with the formulation in situations involving complex learning tasks. The second assumption does not fare as well as the first. Studies do not clearly demonstrate that external demands for performance create a stressful situation. Evidence does exist to suggest that an increase in learning following demands for performance may be related to the establishment of a situational expectancy. This is not to say that demands for performance do not increase the stressfullness of the situation, merely that an increase in learning following demands for performance can be explained in a number of ways.

It is reasonable to assume that verbal statements of performance expectations stated by an authority figure may be similar to teacher's demands for performance, hence producing either stress or expectancy. It follows that a study of the individual and combined influence of performance expectations and anxiety on learning should provide data to partially test Johnson's hypothesis.

II. EXPERIMENTAL PROCEDURES

A. Design

Primary interest in this study centered upon the main effects and interaction effects of three sets of variables on each of three learning tasks. These variables were:

(a) educable mentally retarded children with high manifest anxiety versus educable mentally retarded children with low manifest anxiety.

(b) positive performance expectations versus neutral performance expectations versus negative performance expectations.

(c) boys versus girls.

A schematic view of the design is presented in Table 1.

From the two anxiety variables, the two sex variables, and the three performance expectations variables a 2 x 2 x 3 design was selected. This design served as the major vehicle for hypothesis testing in the investigation.

B. Manifest Anxiety

1. The Children's Manifest Anxiety Scale (See Appendix B)

The Children's Manifest Anxiety Scale (CMAS) was adapted from the Taylor Adult Manifest Anxiety Scale (Taylor, 1953, pp. 285-290). The CMAS initially was designed for and standardized with fourth, fifth, and sixth grade children (Castaneda, McCandless, and Palermo, 1956, pp. 317-326). More recently the scale has been standardized on third grade children (Halloway, 1959, pp. 193-196; 1961, pp. 129-134) and seventh, eighth, and ninth grade children (Keller and Rowley, 1962). The CMAS consists of 53 statements to which the child is to respond with either a yes or a no. The scale furnishes two scores, an anxiety score (A score) based upon the responses to 42 items and a lie score (L score) based upon the responses to 11 items. The L score was designed to provide an estimate of the truthfulness with which the child responds to the 53 items. The CMAS was designed to be a group self-administering test. The testee was instructed to read each statement and circle either the yes or the no answer that followed each item.

TABLE 1

THE DESIGN OF THE STUDY INDICATING THE TWELVE EXPERIMENTAL GROUPS

(N = 6 per group)

High Manifest Anxiety		Low Manifest Anxiety	
Boys	Girls	Boys	Girls
A. Positive Expectancy	D. Positive Expectancy	G. Positive Expectancy	J. Positive Expectancy
B. Neutral Expectancy	E. Neutral Expectancy	H. Neutral Expectancy	K. Neutral Expectancy
C. Negative Expectancy	F. Negative Expectancy	I. Negative Expectancy	L. Negative Expectancy

A number of efforts to determine reliability have been reported in the literature. Administering the CMAS to 361 children, Castaneda, McCandless, and Palermo (1956, pp. 317-326) reported a test-retest (one week) reliability coefficient for the A score of .90 and for the L score of .70. Palermo (1959, pp. 53-57) administered the CMAS to 536 subjects followed by a second administration one month later. He reported reliability coefficients ranging from .59 to .91 for the A score and from .39 to .98 for the L score. The majority of the coefficients were .75 or above. Somewhat higher test-retest (two weeks) reliability coefficients have been reported by Lipsitt (1958, pp. 463-472). Employing 298 children, Lipsitt reported reliability coefficients for the A score ranging from .83 to .93.

The question of the validity of the CMAS has not been resolved nor consistently studied. The Taylor Manifest Anxiety Scale (TMAS), from which the CMAS was adapted, was developed to test specific hypotheses derived from Hull-Spence Learning theory (Taylor, 1956, pp. 303-320). The scale consisted of items from the Minnesota Multiphasic Personality Inventory (MMPI), adjudged by a jury of clinic psychologists to be indicative of manifest anxiety. Subsequent attempts to determine the validity of the TMAS have been inconsistent.

Kitano (1960, pp. 67-72) attempted to study the validity of the CMAS by administering the scale to 124 boys attending "adjustment classes" and to a matched grade sample of 153 boys attending regular classes. The children attending the special classes had been diagnosed as high anxious and rigid. The "adjustment class" group were found to have signigicantly (.01 level) higher A scores than the matched normal group. No difference was found in L score between the two groups. Other attempts to determine the validity of the CMAS have been reported. Iscoe and Cochran (1960, p. 97), employing a five-point rating scale, had homeroom teachers rate the adjustment of 30 pupils who had scored high on the CMAS and 30 pupils who had scored low on the CMAS. The low but significant (.01 level) rank order correlation of .37 obtained led the authors to conclude that: "Manifest anxiety would appear to be an observable characteristic, noticeable to those familiar with the S's everyday school behavior" (Iscoe and Cochran, 1960, p. 97).

The few reported studies dealing with the validity of the CMAS do not provide sufficient evidence to substantiate the validity of the CMAS. However, the CMAS was designed for and remains a research instrument. As such and within the theoretical formulation within which it was developed, the CMAS remains a useful instrument. Support for or discredit of the use of the CMAS as a valid instrument for the measurement of factors contributing to or interfering with learning should occur as the instrument is employed in research arising from Hull-Spence Learning Theory.

The CMAS has been employed with mentally retarded children with alterations in administration due to limited reading skills. Typically the alterations have included an oral presentation of the CMAS items rather than a self-administration and individual or small group administration rather than group administrations (Hall, 1959, pp. 22-23); Lipman and Griffith, 1960, pp. 342-348; Matthews and Levy, 1961, pp. 577-584; Cochran and Cleland, 1963, pp. 539-542). The difference between individual and group administrations probably does not exceed two to three points (Malpass, Mark, and Palermo, 1969, pp. 305-308).

Studies of reliability employing the altered procedures and retarded children have been reported. Hall (1959, p. 36) reported a test-retest (one week) rank order reliability coefficient of .94 for the A score when the CMAS was administered to 26 EMR children. Matthews and Levy (1961, pp. 577-584) administered the CMAS to 30 mentally retarded subjects. The rest-retest (two weeks) reliability coefficient of .84 was obtained for the A score and .86 for the L score. Pryer and Cassel (1962, pp. 860) reported a test-retest (one week) reliability coefficient of .73 for the CMAS A score when administered to 66 mentally retarded subjects. Although the test-retest reliability coefficients reported for the CMAS with either normal or retarded children are not high by mental tests standards, Guilford (1954, p. 388) has suggested that lower reliability coefficients can be tolerated for research purposes than would be acceptable for diagnostic or prediction purposes.

C. Subjects

1. Selection and grouping

Educable Mentally Retarded (EMR) children enrolled in 31 special classes were administered the Children's Manifest Anxiety Scale (Castaneda, McCandless, and Palermo, 1956, pp. 317-326). The usual CMAS administration procedures were altered for use with a mentally retarded population. Although originally developed as a self-administering, group instrument, this procedure was considered inappropriate for EMR children with limited reading skills. The altered procedures included orally reading the CMAS statements to the child while he followed in his test booklet. The child then circled either a yes or a no answer printed adjacent to each statement.

The CMAS was administered by the experimenter (E) to the EMR population individually and in small groups. The number of children in each group was determined by consultation with the teacher. The child's comprehension level, mental age, and ability to follow directions were determining factors. In no instance did the group exceed ten children. In a few instances the CMAS was administered to an individual child. The majority of the children were administered the instrument in groups of from two to four children. The experimenter administered the CMAS to each of the available EMR children. Regardless of the number of children in each group, the CMAS was orally administered with identical directions (see Appendix B).

The 31 public school special classes for (EMR) children were located in Beaver County, Pennsylvania. Approximately 400 EMR children were enrolled in the classes. Of the 31 special classes, 13 were located at the secondary level and 18 were located at the elementary level. Conferences were held with the teachers of the 31 classes to explain the nature and purpose of the study. Their willingness to cooperate with the investigation was secured.

The CMAS was administered to 361 of the 400 EMR children enrolled in the 31 special classes. The instrument was not administered to 39 children with health records reporting gross sensory and/or motor dysfunctions. Children who had been medically diagnosed as emotionally disturbed were also excluded from the study. Of the 361 children administered the CMAS, 22 subsequently were eliminated as possible subjects as a result of gross motor and/or sensory dysfunctions not reported on their health records or due to failure to understand the CMAS statements.

The results of the CMAS administered to 339 EMR children who were ostensibly without known gross motor and/or sensory dysfunctions, and without medically diagnosed emotional disturbances, and without know lack of comprehension of the CMAS statements are presented in Table 2.

TABLE 2

CMAS SCORES AND COMPARISONS OF A SCORES AND L SCORES FOR MALE AND FEMALE EMR SUBJECTS

(N=339)

CMAS	Sex	Boys (N=211)	Girls (N=128)	Total (N=339)	Sex Comparison	
A	$\bar{X}$	20.18	23.30	21.36	Diff.	t ratio
score	S.D.	8.26	7.48	8.10	3.12	3.56*
L	$\bar{X}$	5.31	5.65	5.44	.34	.997
score	S.D.	2.02	3.45	2.79		

*Significant (df 210 and 127, t .05 = 1.979 at 125 df)

The 339 EMR children consisted of 211 boys and 128 girls. The CMAS anxiety scores (A scores) ranged from 3 to 42 with a mean of 21.36 and a standard deviation of 8.10. Both the median and mode were 22. The CMAS lie scores (L scores) ranged from 0 to 9 with a mean of 5.44 and a standard deviation of 2.79. The means of the A scores and L scores are similar to those reported for the CMAS administered orally to other groups of mentally retarded children (Malpass, Mark, and Palermo, 1960, pp. 305-308; Pryer and Cassel, 1962, p. 860). Consistent with other studies, the mean A score obtained is higher than the mean A scores of 16.9 and 16.4 reported for elementary school children and junior high school children respectively (Keller and Rowley, 1962, pp. 375-381).

In order to determine if significant differences existed between the mean A scores and mean L scores obtained by male and female EMR children, the significance of the differences was tested by means of the $\underline{t}$ test for independent samples with unequal N's (Edwards, 1954, p. 253).[1] The results, presented in Table 2, show that significant differences exist between the mean A scores obtained by boys and girls. The girls mean A score is significantly ($p. < .05$ level, two-tailed test) higher than the mean A score obtained by boys. The finding of significantly higher A scores for girls than for boys is consistent with previous studies (Palermo, 1959, pp. 53-57; Malpass, Mark, and Palermo, 1960, pp. 305-308). The mean L scores obtained by boys and girls did not significantly differ. The significant sex differences supported the retention of sex as one of the three main variables in the study.

The distribution of A scores was divided into thirds. The upper third of the distribution was designated the high anxiety (HA) group and the lower third of the distribution was designated the low anxiety (LA) group. The HA group consisted of 122 children with A scores ranging from 25 to 42. The LA group included 115 children with A scores ranging from 3 to 17. The middle third of the distribution consisted of 102 children with A scores above 17 and below 25. The 102 EMR children with A scores from 18 to 24 (approximately one standard deviation) were excluded from the study. The elimination of the middle group was used with the hope of making any differences related to the anxiety variable more easily discernable.

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[1] The $\underline{t}$ test for the means of independent samples with unequal N's was employed throughout the study. All tests of significance are two-tailed tests.

An additional 64 children, 22 from the LA group and 42 from the HA group, were eliminated from the study. The basis for exclusion included mental ages below seven years, zero months; L scores of eight or above; Stanford-Binet IQ's below 50 or above 79; or a pattern of responses on the CMAS suggesting a possible response set. The exclusion of children with MA's below seven years was a modification of the suggestion by Pryer and Cassel (1962, p. 860) to restrict the use of the CMAS to EMR children with MA's of eight years and above. The exclusion of EMR children with L scores of eight or above was based upon the notion that the L score provides a measure of falsification (Castaneda, McCandless, and Palermo, 1956, pp. 317-326). By excluding those children with high L scores, increased confidence in the HA-LA classification should be possible.

Matthews and Levy (1961, p. 583) have suggested, " . . . that the scores of retardates on the CMAS are strongly influenced by response sets." A response set is ". . . a set to follow a certain pattern in responding. . . ." (English and English, 1958, p. 496). Children who clearly evidenced such sets were excluded from the study. Criteria for patterns of responses adjudged as possible response sets included: (a) alternately circling the yes and no answer; (b) circling only the no answers or, only the yes answers; and (c) circling the yes-no answers in a reoccurring combination. The results of the CMAS administered to 173 EMR children with MA's of seven or above, L scores of seven or below, Stanford-Binet IQ's between 50 and 79 and no recognized response set are presented in Table 3.

TABLE 3

COMPARISONS OF CMAS A SCORES AND L SCORES OF EMR CHILDREN FROM THE UPPER AND LOWER THIRDS OF THE A SCORE DISTRIBUTION

(N=173)

		High Anxiety Group			Low Anxiety Group		Comparisons			
Sex		A scores	L scores		A scores	L scores	A scores		L scores	
	N	40		N	68					
Boys	$\bar{X}$	28.95	4.60	$\bar{X}$	11.97	4.90				
	S.D.	3.27	2.01	S.D.	3.69	1.87				
	N	40		N	25					
Girls	$\bar{X}$	30.00	4.72	$\bar{X}$	12.76	5.72				
	S.D.	3.78	1.87	S.D.	3.71	1.81				
	N	80		N	93		Diff.	t ratio	Diff.	t ratio
Total	$\bar{X}$	29.48	4.66	$\bar{X}$	12.18	5.12	17.30	31.397*	.46	1.575
	S.D.	3.55	1.93	S.D.	3.69	1.88				

*Significant (df 79 and 92, t .05 = 1.992 at 75 df)

The 173 EMR children consisted of 108 boys and 65 girls. The HA group consisted of 80 children, 40 boys and 40 girls. The LA group contained 93 children, 68 boys and 25 girls. The HA group's mean A score was 29.48 with a standard deviation of 3.55. The mean L score was 4.66 with a standard deviation of 1.93. The LA group's mean A score was 12.18 with a standard deviation of 3.69. The mean L score was 5.12 with a standard deviation of 1.88. The significance of the differences between mean A scores and L scores obtained by the HA and

LA groups was tested by means of the *t* test. The difference between the mean A scores of the HA and LA groups was found to be significant ($p. <$ .05 level) but the difference between the mean L scores was not found to be significant. The significant difference between A score means for the HA and LA groups was to be expected due to the procedure by which the groups were formed.

Since the experimental design included HA and LA mentally retarded children who were similar in mental age, group comparisons were made to determine if significant differences in mental age existed in the population from which the experimental subjects were to be selected. The results of these comparisons are presented in Table 4.

TABLE 4

MEAN MENTAL AGE, STANDARD DEVIATION, AND COMPARISONS OF MENTAL AGE FOR MALE AND FEMALE EMR CHILDREN OF HIGH AND LOW CMAS A SCORES

(N=173)

Sex	High Anxiety MA	(months)	Low Anxiety MA	(months)	Comparisons		
	N	40	N	68	Diff.	S.E.Diff.	*t* ratio
Boys	$\bar{X}$	107.30	$\bar{X}$	118.69	11.39	2.882	3.952*[a]
	S.D.	13.12	S.D.	16.48			
	N	40	N	25			
Girls	$\bar{X}$	109.98	$\bar{X}$	110.08	.10	3.826	.026
	S.D.	15.27	S.D.	14.85			
	N	80	N	93			
Total	$\bar{X}$	108.64	$\bar{X}$	116.38	7.74	2.330	3.322*[b]
	S.D.	14.21	S.D.	16.44			
Diff.		2.68		8.61			
S.E. Diff.		3.184		3.580			
t ratio		.842		2.405*[c]			

[a]*Significant (df 39 and 67, *t* .05 = 2.025 at 38 df)
[b]*Significant (df 79 and 92, *t* .05 = 1.992 at 75 df)
[c]*Significant (df 24 and 67, *t* .05 = 2.064 at 24 df)

The boy's mean MA in the LA group was significantly ($p. < .05$ level) higher than the mean MA for boys in the HA group. No significant difference in MA was found for the girls. Disregarding the sex dichotomy, the mean MA for the LA group was significantly ($p. < .05$ level) higher than for the HA group. No significant sex difference for MA was found within the HA group. However, boys in the LA group had a significantly ($p. < .05$ level) higher mean MA than LA girls. Additional inspection suggests that the high MA of the LA boys was largely responsible for the three significant differences in MA found in making the group comparisons.

In order to explore the basis for the significant differences found in MA, group comparisons were made to determine if significant differences existed in IQ or CA. No significant differences were found between the groups in IQ. However, significant differences were found between the groups when group comparisons were made on CA. The results of the group comparisons on CA are presented in Table 5.

Boys in the LA group had a significantly ($p. < .05$ level) higher mean CA than boys in the HA group. No significant difference in CA was found for the girls. Disregarding sex, the LA group's mean CA was significantly ($p. < .05$ level) higher than the HA group's mean CA. No significant differences in mean CA were found between boys and girls within either the HA or LA groups.

Due to the limited number of HA and LA mentally retarded children remaining from the original population, the selection of the desired number of subjects matched on MA was impossible. While subjects selected randomly would reflect the same significant group differences in MA found in the population from which they were selected, statistical methods to control for MA could be applied. Consequently, from the 40 HA boys, 40 HA girls, 68 LA boys, and 25 LA girls available for possible inclusion in the study, 18 boys and 18 girls were randomly selected from each of the two anxiety groups.

The 72 subjects were randomly assigned to the three expectancy treatments. Random assignment to the three treatments was conducted

TABLE 5

MEAN CHRONOLOGICAL AGE, STANDARD DEVIATIONS, AND COMPARISONS OF CHRONOLOGICAL AGE FOR MALE AND FEMALE EMR CHILDREN OF HIGH AND LOW CMAS A SCORES

(N=173)

Sex	High Anxiety CA	(months)	Low Anxiety CA	(months)	Comparisons		
	N	40	N	68	Diff.	S.E. Diff	*t* ratio
Boys	$\bar{X}$	164.20	$\bar{X}$	179.43	15.23	4.725	3.223*[a]
	S.D.	25.47	S.D.	20.38			
	N	40	N	25			
Girls	$\bar{X}$	168.30	$\bar{X}$	179.20	10.90	6.102	1.786
	S.D.	26.29	S.D.	22.34			
	N	80	N	93			
Total	$\bar{X}$	166.25	$\bar{X}$	179.37	13.12	3.602	3.642*[b]
	S.D.	25.80	S.D.	20.80			
Diff.		4.10		.23			
S.E. Diff.		5.787		5.106			
t ratio		.708		.045			

[a] *Significant (df 39 and 67, *t* .05 = 2.025 at 38 df)

[b] *Significant (df 79 and 92, *t* .05 = 1.992 at 75 df)

separately for each sex group from each anxiety group. As a result of the random procedures employed, six boys and six girls from each of the HA and LA groups were assigned to each of the three performance expectancy groups. The total sample of 72 subjects were thus divided into twelve groups (A to L) of six subjects each. Table 6 was prepared to facilitate preliminary comparisons among the six HA groups and 6 LA groups.

TABLE 6

MEAN CHRONOLOGICAL AGE, MENTAL AGE, INTELLIGENCE QUOTIENT, A SCORE, AND L SCORE FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS
(N = 6 subjects per group)

Group	Mean CA(months)	Mean MA(months)	Mean IQ	Mean A Score	Mean L Score	Type of Group
A	164.83	106.00	67.83	29.67	4.50	HA boys -ES
B	166.83	111.00	69.83	30.50	5.67	HA boys -EN
C	159.11	107.67	71.83	27.17	3.33	HA boys -EF
D	166.33	113.50	70.67	29.17	3.67	HA girls -ES
E	181.00	112.50	66.17	27.50	3.50	HA girls -EN
F	156.83	101.00	68.83	30.17	5.67	HA girls -EF
HA Mean	165.83	108.61	69.19	29.03	4.39	
G	186.83	127.50	71.83	10.67	4.50	LA boys -ES
H	181.67	118.00	68.83	12.67	4.50	LA boys -EN
I	165.67	115.50	73.17	13.17	5.50	LA boys -EF
J	185.50	116.83	68.67	12.17	5.17	LA girls -ES
K	160.50	100.17	65.67	13.00	5.50	LA girls -EN
L	193.50	114.67	64.67	12.33	5.83	LA girls -EF
LA Mean	178.94	115.44	68.81	12.33	5.17	
Total	172.36	112.03	69.00	--	4.78	

2. Manifest Anxiety

Since the experimental design included male and female EMR children of high and low anxiety exposed to different performance expectations, a significant difference in CMAS A scores between the HA and LA groups was essential. The lack of a significant difference in A scores between the two anxiety groups would have prevented the use of the anxiety variable in the study. In order to increase the likelihood of a significant difference in A scores, the selection of subjects from the upper and lower thirds of the distribution, with the accompanying reduction in available subjects, was considered a reasonable experimental approach.

The CMAS data for the experimental subjects was evaluated by means of analysis of variance to test for differences in group means related to the main effects and all interaction effects of the sex, anxiety, and treatment variables. The mean A score of the HA group was 29.03 (Table 6). The mean A score of the LA group was 12.33 (Table 6). Inspection of Table 7 will reveal that the difference in A scores was significant at the .05 level (F = 367.25, df = 1 and 60, F.05 = 4.00). No significant differences in A scores were found between sex groups, among treatment groups, or among any of the interactions of three variables. The significant difference between the HA and LA groups on A score supported the procedure of selecting high and low anxiety subjects from the upper and lower thirds of the A score distribution.

An F max test[1] of homogeneity of variance as described by Walker and Lev (1953, p. 192) was completed for all subjects assigned to the 12 experimental groups. The test was applied to determine if the assumption of homogeneity of variance underlying the analysis of variance technique had been achieved. The resulting F max ratio (Table 12) indicated no significant difference in group variances for the 12 experimental groups (F max = 9.333, k = 12, n = 5, F max .05 = 29.9). The null hypothesis of no difference in variance was supported for the A score data.

Since the CMAS L score is reported to be a measure of falsification (Castaneda, McCandless, and Palermo, 1956, pp. 317-326), significant group differences in mean L scores would have produced a

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[1] The formula used was F max = $\frac{S^2\text{max}}{S^2\text{min}}$ where S^2max is the largest variance and S^2 min is the smallest variance. The test rests on the assumption that if the largest ratio is not significantly large, none of the others will be. A special F max table is required for interpretation.

TABLE 7

ANALYSIS OF VARIANCE OF CMAS A SCORES FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	0.13	1	0.13	---
Between Anxiety	5016.68	1	5016.68	367.25*
Between Treatments	3.04	2	1.52	---
Interaction: Sexes X Anxiety	1.13	1	1.13	---
Interaction: Sexes X Treatments	19.07	2	9.54	---
Interaction: Anxiety X Treatments	15.52	2	7.76	---
Interaction: Sexes X Anxiety X Treatments	43.59	2	21.80	1.60
Within Groups	819.50	60	13.66	
Total	5918.66	71		

*Significant (df 1 and 60, F .05 = 4.00)

Note: Throughout the study, three dashes (---) will represent F values below 1.00.

confounding influence in the use of the anxiety variable. Inspection of Table 8 will reveal that there were no significant differences in mean L scores between sex, anxiety, or treatment groups, or any of the interactions of these three variables. The F max test of homogeneity of variance was completed for all subjects assigned to the 12 experimental groups. The resulting F max ratio (Table 12) indicated no significant difference in group variances for the 12 groups (F max = 6.285, k = 12, n = 5, F max .05 = 29.9). The null hypothesis of no difference in variances was supported for the L score data.

TABLE 8

ANALYSIS OF VARIANCE OF CMAS L SCORES FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	0.88	1	0.88	---
Between Anxiety	10.88	1	10.88	2.67
Between Treatments	4.69	2	2.34	---
Interaction: Sexes X Anxiety	3.57	1	3.57	---
Interaction: Sexes X Treatments	11.87	2	5.94	1.46
Interaction: Anxiety X Treatments	1.70	2	.85	---
Interaction: Sexes X Anxiety X Treatments	20.85	2	10.42	2.56
Within Groups	244.00	60	4.07	
Total	298.44	71		

3. Mental Age

Since the experimental design specified that the HA and LA groups should not differ on MA, the MA data for the experimental subjects were evaluated by means of analysis of variance to test for differences in group means related to the main effects and all interaction effects of the sex, anxiety, and treatment variables. The mean MA of the HA group was 108.61 months and the mean MA of the LA group was 115.44 months (Table 6). An inspection of Table 9 reveals that this difference in MA was significant at the .05 level ($F = 4.22$, df 1 and 60, $F_{.05} = 4.00$). The differences in MA between the sex, and treatment groups, or any of the interactions of the three variables were not significant.

The F max test of homogeneity of variance was completed for all subjects assigned to the 12 experimental groups. The resulting F max ratio (Table 12) indicated no significant difference in group variances (F max = 7.193, k = 12 and n = 5, F max .05 = 29.9). The null hypothesis of no differences in variances was supported for MA.

TABLE 9

ANALYSIS OF VARIANCE OF MENTAL AGE FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variance	SS	df	Mean SS	F
Between Sexes	364.50	1	364.50	1.83
Between Anxiety	840.50	1	840.50	4.22*
Between Treatments	562.18	2	281.09	1.41
Interaction: Sexes X Anxiety	501.37	1	501.37	2.52
Interaction: Sexes X Treatments	135.09	2	67.54	---
Interaction: Anxiety X Treatments	820.59	2	410.29	2.06
Interaction: Sexes X Anxiety X Treatments	605.38	2	302.69	1.52
Within Groups	11954.36	60	199.24	
Total	15783.94	71		

*Significant (df = 1 and 60, F .05 = 4.00)

The finding of a significant difference in MA between the HA and LA groups was to be expected. The population from which the sample was randomly selected contained significant group differences in MA (Table 4). However, since a significant difference in MA between the HA and LA groups could introduce a biasing effect, the need to control for the difference in MA became essential. The initial attempt to eliminate the possible bias included collapsing the sex variable and establishing a MA variable. The MA's of the 72 subjects ranged from 84 months to 143 months with a mean of 112.03 months and a median of 112.00 months. Dividing the distribution at the median, 34 subjects with an MA of 113 and above were designated high MA and 38 subjects with an MA of 112 months and below were designated as low MA. The resulting 2 (MA) X 2 (anxiety) X 3 (treatment) design had unequal and unproportional N's which was inappropriate for available analysis of variance techniques.

The inability to control the significant difference in MA between HA and LA groups by reordering the data to include high and low MA groups resulted in MA being designated a covariant. The subject's MA was then controlled by analysis of covariance procedures.

4. Chronological Age

Although CA was not included in the original design, the significant difference in CA between the HA and LA groups revealed in Table 5 produced the need to evaluate the CA data for the experimental subjects by means of analysis of variance to test for differences in group means related to the main effects and all interaction effects of the sex, anxiety, and treatment variables. The mean CA of the HA group was 165.83 months (Table 6). The mean CA of the LA group was 178.94 (Table 6). Inspection of Table 10 reveals that this difference was significant at the .05 level (F = 5.15, df = 1 and 60, F.05 = 4.00). The differences in CA between the sex groups, treatment groups, and all interactions were not statistically significant.

TABLE 10

ANALYSIS OF VARIANCE FOR CHRONOLOGICAL AGE FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	174.22	1	174.22	---
Between Anxiety	3094.22	1	3094.22	5.15*
Between Treatments	602.53	2	301.26	---
Interaction: Sexes X Anxiety	32.00	1	32.00	---
Interaction: Sexes X Treatments	874.78	2	437.39	---
Interaction: Anxiety X Treatments	2291.03	2	1145.52	1.91
Interaction: Sexes X Anxiety X Treatments	3217.66	2	1608.83	2.68
Within Groups	36064.67	60	601.08	
Total	46351.11	71		

*Significant (df = 1 and 60, F .05 = 4.00)

The F max test of homogeneity of variance was completed for all subjects assigned to the 12 experimental groups. The resulting F max ratio (Table 12) indicated a significant difference in group variances (F max = 35.930, k = 12, n = 5, F max .05 = 29.9). The null hypothesis of no significant differences in variances was not supported for chronological age.

The CA of the 72 subjects ranged from 117 months to 223 months with a mean of 172.36 months and a median of 178 months. In an attempt to eliminate any biasing influence, the distribution of CA was divided at the median. The 34 subjects with a CA of 179 months and above were designated high CA. The 38 subjects with a CA of 178 months and below were designated low CA. The resulting 2 (CA) X 2 (anxiety) X 3 (treatment) design contained unequal and unproportional N's which was inappropriate to available analysis of variance techniques.

The inability to control the significant difference in CA between HA and LA groups by reordering the data to include high and low CA groups resulted in CA being designated a covariant. The CA of the subject was then controlled by analysis of covariance procedures.

5. Intelligence Quotient

Intelligence Quotient was not included in the original design. The significant differences in MA and CA between the HA and LA groups created the need to evaluate the IQ data for the experimental subjects by means of analysis of variance to test for differences in group means related to the main effects and all interaction effects of the sex, anxiety, and treatment variables. Inspection of Table 11 will reveal that there were no differences in IQ between anxiety groups, sex groups, treatment groups, or any of the interactions of the three variables.

The F max test of homogeneity of variance was completed for all subjects assigned to the 12 experimental groups. The resulting F max ratio (Table 12) indicated no significant differences in group variances (F max = 15.279, k = 12 and n = 5, F max .05 = 29.9). The null hypothesis of no differences in variances was supported for IQ.

6. Summary of Data on Subjects

The analysis of the data on the subjects confirmed the significance of the differences in mean CMAS A scores between high anxiety subjects and low anxiety subjects selected from the upper and lower thirds of the A score distribution. No differences in mean A score were found between boys and girls, treatment groups, or any of the interactions of the three variables. No differences were found in CMAS L scores or in IQ between anxiety groups, sex groups, treatment groups, or any of the interactions of these variables.

TABLE 11

ANALYSIS OF VARIANCE FOR INTELLIGENCE QUOTIENT FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	174.22	1	174.22	3.94
Between Anxiety	2.72	1	2.72	---
Between Treatment	68.25	2	34.12	---
Interaction: Sexes X Anxiety	60.50	1	60.50	1.37
Interaction: Sexes X Treatments	94.36	2	47.18	1.07
Interaction: Anxiety X Treatments	18.69	2	9.34	---
Interaction: Sexes X Anxiety X Treatments	39.26	2	19.63	---
Within Groups	2650.00	60	44.17	
Total	3108.00	71		

TABLE 12

F MAX TEST OF HOMOGENEITY OF VARIANCE FOR CMAS A AND L SCORES, MENTAL AGE, CHRONOLOGICAL AGE, AND INTELLIGENCE QUOTION OF 72 EMR SUBJECTS ASSIGNED TO TWELVE EXPERIMENTAL GROUPS

Variable	Maximum Variance	Minimum Variance	k mean Squares	n-1	F max
CMAS A score	25.200	2.700	12	5	9.333
CMAS L score	6.700	1.066	12	5	6.285
Mental Age	383.900	53.368	12	5	7.193
Chronological Age	1587.368	44.180	12	5	35.930*
Intelligence Quotient	95.768	6.268	12	5	15.279

*Significant (k = 12 and n = 5, F max .05 = 29.9)

The analysis of the data on the subjects found significant differences in mean MA and CA between the HA and LA groups. The mean MA and CA were significantly higher for the LA group than for the HA group. The data failed to show differences in group means for MA or CA between sex groups, treatment groups, or any of the interactions of the three main effects variables.

The significant differences in mean CA and MA between anxiety groups confounded the original experimental design. Attempts to reorder the data to control for MA and CA were unsuccessful, hence, CA and MA were designated covariants to be controlled through analysis of covariance techniques.

D. The Experimenter

The administration of the CMAS, the exposure of the three learning tasks, and the delivery of the verbal treatments to the subjects in this study were completed by the experimenter. He was employed as Supervisor of Special Education for the Beaver County Public Schools, Beaver, Pennsylvania. He had six years experience as the Supervisor of Special Classes and had been directly responsible for the administration and supervision of the special classes for educable mentally retarded children in the public schools of Beaver County. He was known to the 31 teachers of special classes for EMR children and to the EMR children enrolled in the classes as an authority figure analogous to that of a principal.

E. Learning Tasks

1. Object Assembly Task (see Appendix C)

The object assembly task employed in this study was an adaptation of a task developed for use with retarded subjects (Johnson and Blake, 1960, p. 187). The task, designed as a nonsense task, consisted of a five part wood assembly. The subject, after a brief instruction and practice period, was required to disassemble and reassemble five identical assembly units as quickly as possible. The task was presented for five trials with a thirty-second rest period between trials. The total time to disassemble and reassemble the five assembly units was recorded for each trial.

The object assembly task may be viewed as primarily a sensorimotor learning task involving perceptual-motor skills. The adaptations in the task, the instructions, and the practice period were designed to simplify the original task thereby reducing and minimizing the need for higher mental processes in completing the task. The task was selected and adapted for the study to represent a simple learning task with a few competing response alternatives.

2. Digit Substitution Task (see Appendix D)

The digit substitution task employed in this study was an adaption of a task developed by Johnson and Blake (1960, pp. 163-185). The task consisted of the Arabic numerals one through nine randomly assigned to represent the first nine letters of the alphabet. The subject, after a brief instruction and practice period, was required to write the correct number in a blank box immediately below the appropriate letter. The subject could refer to an example as frequently as he found it necessary. The task was presented in a booklet form consisting of six pages. The first page contained an example of the nine letter-numeral combinations and a practice series of nine letters, to which the subject was to write the appropriate numerals in blank boxes. Each of the remaining five pages constituted a separate trial of the learning task. Each trial page consisted of a completed sample identical to the sample on the first page and eight rows of nine letter-blank box combinations. The sequence of letters was randomly selected for each page.

The task was presented for five trials with a thirty-second rest period between trials. The subject was permitted sixty seconds to complete a possible maximum of 72 correct responses for each trial. The number of correct responses during the one-minute period was recorded for each trial.

The task may be viewed as a paired associates learning task involving rote learning of stimulus-response associations and motor dexterity. The more rapidly the subject learns the correct letter-numeral combinations, the more rapidly he performs the task and the higher his score. The task was selected for the study to represent a task of intermediate difficulty.

3. Concept Identification Task (see Appendix E)

The concept identification task employed in this study was an adaptation of a task employed in a series of studies on concept formation (Griffith and Spitz, 1958, pp. 247-251; Lipman and Griffith, 1960, pp. 342-348; Miller and Griffith, 1961, pp. 270-276). The task consisted of eight three-word sets representing the four concepts of large, small, round, and white. Two different three-word sets were used for each concept. The subject, following a brief instruction and practice period, was required to identify and verbally report a similarity within each set of words. The task was presented for six trials with a thirty-second rest period between trials. The sequence of the words in each set and the serial position of each set within each trial were randomly selected by means of a table of random numbers. The subject was permitted twenty seconds to respond to each set of words. The number of correct concepts identified on each of the six trials was recorded.

The task involves the ability to discover a similarity among sets of words presented in an abstraction task. In essence the task may be viewed in terms of what Milgram and Furth (1963, pp. 733-734) have described as "concept attainment," or the present use of concepts previously acquired as opposed to concept formation or the acquisition of new concepts. The task was selected for the study to represent a complex learning task involving many competing response alternatives.

F. Conditions of Task Administration

The subjects (Ss) in this study were individually presented the learning task by the experimenter (E). Upon entering S's classroom, E briefly engaged the teacher in conversation. Since E was known to the Ss as an authority figure somewhat analogous to that of a principal, the brief conversation with the teacher was a typical and probably expected procedure. Each S was then informed by the teacher that he was to accompany E to the examining room. Each S was escorted to the experimental room by E. No attempt was made to avoid conversation with S although conversation was avoided which related to the investigation.

As the experimental room was approached, E opened the door and motioned S to a chair facing a table containing the experimental tasks. The rooms usually were small private offices in the school in which S was enrolled. In several instances, empty classrooms were used when private offices were unavailable. Each of the rooms was relatively free from distracting influences.

As soon as S was seated, E would say: "I want you to do a few things for me." If S inquired as to what he was to do, E simply said: "I'll show you." Each S was administered an Unsolvable Problem as the initial task (see Appendix F). Upon completing the Unsolvable Problem task, the first of the three learning tasks was administered to S. The three learning tasks were administered to each S according to a predetermined counter-balanced order. The counter-balanced order, as suggested by Hilgard (1951, p. 537), was selected to eliminate any influence that might arise from a fixed serial position effect. The Digit Substitution Task was assigned the letter A, the Object Assembly Task was assigned the letter B, and the Concept Identification Task the letter C. The counter-balanced order employed was ABC, CBA, BCA, ACB, CAB, and BAC. Each of the six ABC combinations was assigned randomly to 12 Ss. The learning tasks were administered according to instructions developed and modified as a result of a brief pre-testing of the tasks with EMR children with CMAS A scores in the middle third of the A score distribution. These children were not selected for subjects.

The method of creating performance expectations was a modification of a procedure employed by Tyler (1958, pp. 166-172). In the performance expectation conditions, encouraging and discouraging verbal statements were delivered in a randomized order. Verbal statements designated ES-1 and EF-1 were delivered at prearranged times during the instructions preceding each of the three learning tasks (see Appendices C, D, and E). Verbal statements designated ES-2 and EF-2 were delivered during the inter-trial rest periods accompanying each of the learning tasks. The verbal statements were delivered at the prearranged time regardless of the quality of or the lack of S's response.

The verbal statements employed in the encouraged verbal treatment were designed to produce an expectancy of success. The statements were supportive of S's efforts but indicated E's expectation that S would improve his performance on the next trial. The verbal statements employed in the discouraged verbal treatment were designed to produce an expectancy of failure. The statements were supportive of S's efforts but indicated E's expectation that S would not improve his performance on the next trial. The Unsolvable Problem was administered to increase S's acceptance of the validity of the verbal statements.

The verbal statements selected for the study included a modification of statements used by Winschel (1963, p. 23). Additional statements were developed for the study. The statements from the two sources were placed in a pool of possible statements. Separate pools of verbal statements were formed for the encouraged and the discouraged treatments. The pooled statements were presented to EMR children following the brief pre-testing of the learning tasks. The final form of each statement was developed as a result of a subjective assessment of the EMR child's reaction to the statement during the pre-testing period.

The verbal statements were delivered with observable, externalized expression. During the delivery, E attempted to reinforce the encouraging or discouraging content of the statements with appropriate facial and vocal expressions. Between verbal treatments, E attempted to maintain an attentive supportive posture. Whenever S established eye contact with E, E responded with a supportive smile. If S attempted to engage in conversation, E simply continued with the administration of the learning tasks saying: "Let's finish this first. We'll talk later."

The neutral expectancy condition consisted of the administration of the learning tasks without verbal comment. Inter-trial rest periods were preserved in length but E attempted to convey the expression of silent preoccupation with the learning task materials. Every effort was made to maintain the same posture of support during the learning trials as was used with the encouraged and discouraged groups. If S attempted to engage in conversation, E simply continued with the administration of the learning tasks saying: "Let's finish this first. We'll talk later."

Upon completion of the last learning trial of the last learning task, E praised S's performance. The Ss assigned to the discouraged and neutral treatment groups were assured that they had performed well on the three tasks. Each S was thanked for engaging in the study and escorted back to his classroom.

The order in which the 31 cooperating special classes in Beaver County were visited for administration of the learning tasks was randomly determined. Randomization was also employed to determine the order of testing Ss within each classroom. When a subject was absent at the time assigned for exposure to the learning tasks, his name was placed at the end of the testing schedule. No subjects in the original sample had to be replaced, and all took part in the study.

The study took place between 9:00 a.m. and 4:00 p.m. on regular school days. No Ss were exposed to the learning tasks on Friday afternoons or on a school day preceding a school holiday. Testing time for each of the 72 Ss ranged from 45 to 70 minutes. The experimental testing was initiated and completed within a period of six weeks.

G. Analysis of the Data

An analysis of covariance technique was employed to analyze the results of the 2 X 2 X 3 design. Both MA and CA were designated covariants. Analysis of covariance was applied to each trial of each learning task. In addition analysis of variance techniques were employed to analyze selected results of the design. These procedures, applied to each learning task, permitted detection of over-all differences in means for groups arranged on the basis of anxiety level, sex, and performance expectation conditions. They also permitted detection of differences related to the interaction of the three main effects variables.

As noted, all tests of significance were based on the .05 level of confidence. Raw scores for the twelve experimental groups are presented in Appendix A.

H. Limitations of the Study

1. General Limitations

Subjects were selected from a mentally retarded population attending special classes. The subjects were selected on the basis of extreme scores on a manifest anxiety scale, restricting the available population to 173 possible subjects. The validity of the CMAS was not specifically known. The subjects differed significantly as to mental age and chronological age. Variables associated with subjects other than class placement, intelligence quotient, gross motor and sensory dysfunction, diagnosed emotional disturbance, and CMAS L scores were uncontrolled and were assumed to be normally distributed. Only three learning tasks were selected as being representative of a range of possible types of learning. The number of trials on the three learning tasks were limited to either five or six trials. The effect of the investigator's sex upon the performance of male and female subjects was not investigated in this study.

III. RESULTS

A. Introduction

This chapter presents an analysis of the results obtained for each of the three experimental tasks. The mean scores for the twelve experimental groups were computed, and differences between means were evaluated for the two anxiety groups, the three performance expectation treatment groups, the two sex groups, and the interactions of these groupings. Due to the statistical methodological problems described briefly in the preceding chapter and to be discussed more fully in the next chapter, three separate analyses were performed. The first analysis consisted of an analysis of variance for trends[1] (Edwards, 1962, pp. 224-253) over the learning trials. The second analysis consisted of an analysis of covariance for each trial of each learning task with sums of squares adjusted for group differences in CA and MA. The third analysis consisted of both an analysis of variance and of covariance of mean gain scores[2] for the twelve experimental groups for each learning task. An evaluation was also made of homogeneity of variance for the twelve experimental groups for each trial of each task and for gain scores. The tasks are presented in the following order: Object Assembly, Digit Substitution, and Concept Identification. The three analyses performed for each learning task are presented in the chronological order in which they were performed.

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[1] Analysis of variance for trends is more commonly called analysis of variance with repeated measures.

[2] Gain scores have been employed by several investigators who reason that since learning is typically defined as a change in performance with practice, a measure of change (gain) becomes a meaningful way to determine if learning has occurred.

B. Object Assembly Task

The mean Object Assembly Task (OAT) score (in seconds) was the first measure employed to test the main effects and interactions of the two anxiety groups, the two sex groups, and the three treatment groups over the five learning trials. The means for each of the experimental groups are presented in Table 13.

TABLE 13

MEAN SCORES IN SECONDS FOR THE OBJECT ASSEMBLY TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 6 per group)

Group	Type	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Gain Score
A	HA-B-ES	94.19	73.33	66.40	63.92	61.02	-112.07
B	HA-B-EN	87.73	74.33	63.53	65.03	74.62	-73.42
C	HA-B-EF	74.40	64.57	65.60	68.42	55.55	-43.47
D	HA-G-ES	108.05	87.05	75.15	79.68	63.25	-127.07
E	HA-G-EN	97.40	72.35	62.33	61.00	60.58	-133.33
F	HA-G-EF	109.45	94.08	88.73	78.22	68.08	-108.68
G	LA-B-ES	97.68	71.97	65.10	65.47	60.63	-127.57
H	LA-B-EN	64.60	65.55	54.13	53.33	55.02	-30.37
I	LA-B-EF	114.92	85.12	66.95	65.23	65.27	-177.10
J	LA-G-ES	126.12	87.20	69.22	67.80	68.27	-211.98
K	LA-G-EN	123.55	104.05	91.30	78.97	81.73	-138.15
L	LA-G-EF	93.03	69.37	66.98	66.55	63.68	-105.55

An analysis of variance with repeated measures of group means was completed to test the significance of each of the main effects and all interactions. The analysis also tested the significance of the trend in group means over the five learning trials and the significance of differences in the trends of group means related to the main effects of anxiety, treatment, and sex, and all interactions. The results of these analyses are presented in Table 14.

The mean OAT score for experimental groups A, B, C, D, E, and F (high anxiety) was 75.27. The mean OAT score for experimental groups G, H, I, J, K, and L (low anxiety) was 76.96. Table 14 reveals that the difference between means uncorrected for MA and CA was not significant ($F < 1.00$, df = 1 and 60, F .05 = 4.00).

The main effects between sexes was tested by comparing the mean OAT score of groups A, B, C, G, H, and I (boys) with experimental groups D, E, F, J, K, and L (girls). The mean OAT score of these groups was 94.00 and 137.46 respectively. A test for significant difference in mean OAT scores between boys and girls is presented in Table 14. The resultant F was not significant (F = 3.48, df = 1 and 60, F .05 = 4.00). There was no difference in mean OAT scores between the sexes.

The mean OAT score for experimental groups A, D, G, and J (encouraged verbal treatment) was 144.67. The mean OAT score for experimental groups B, E, H, and K (neutral treatment) was 93.82. The mean OAT score for experimental groups C, F, I, and L (discouraged verbal treatment) was 108.70. Inspection of Table 14 reveals that the differences among means were not significant ($F < 1.00$, df = 2 and 60, F .05 = 3.15). No differences existed in mean OAT scores among treatment groups.

The first and second order interactions for anxiety, sexes, and treatments were evaluated. These tests of significance are reported in Table 14. All the resultant Fs were not significant. Therefore, statements about each of the main effects did not need to be qualified by the particular level of any one of the other factors involved, and the two factor interactions for the separate levels of the remaining factors were of the same form.

The OAT data also were evaluated to determine if a significant change in group means occurred over the five learning trials. The

TABLE 14

ANALYSIS OF VARIANCE OF TRENDS OF OBJECT ASSEMBLY SCORES FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS OVER FIVE TRIALS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	12933.61	1	12933.61	3.48
Between Anxiety	257.39	1	257.39	---
Between Treatments	547.68	2	273.84	---
Interaction: Sexes X Anxiety	292.32	1	292.32	---
Interaction: Sexes X Treatments	1625.39	2	812.70	---
Interaction: Anxiety X Treatments	641.91	2	320.96	---
Interaction: Sexes X Anxiety X Treatments	18100.14	2	9050.07	2.44
Error (a)	222886.10	60	3714.77	
Between Trials	56420.77	4	14105.19	49.79*
Interaction: Sexes X Trials	2347.98	4	587.00	2.07
Interaction: Anxiety X Trials	1358.93	4	339.73	1.20
Interaction: Treatments X Trials	2601.84	8	325.23	1.15
Interaction: Sexes X Anxiety X Trials	336.57	4	84.14	---
Interaction: Sexes X Treatments X Trials	1578.58	8	197.32	---
Interaction: Anxiety X Treatments X Trials	2045.40	8	255.68	---
Interaction: Sexes X Anxiety X Treatments X Trials	3202.96	8	400.37	1.41
Error (b)	67992.00	240	283.30	
Total	395169.57	359		

*Significant (df = 4 and 200, F .05 = 2.41)

significance of the trend of group means over the five trials for each of the main effects and all interactions was tested. The results of these analyses are presented in Table 14.

The mean OAT score for trial 1, 2, 3, 4, and 5 was 99.26, 79.08, 69.62, 67.80, and 64.81 respectively. Inspection of Table 14 reveals that the resultant F was significant (F = 49.79, df = 4 and 200, F .05 = 2.41). Reference to Figure 1 will show the trend of mean OAT scores was to decrease with successive trials. The linear component of the trend was 46289.83. The test for the significance of the linear component of the over-all trend was significant (F = 163.40, df = 1 and 200, F .05 = 3.89). It was concluded that a significant change in OAT scores occurred over the five learning trials and that the change was linear in form.

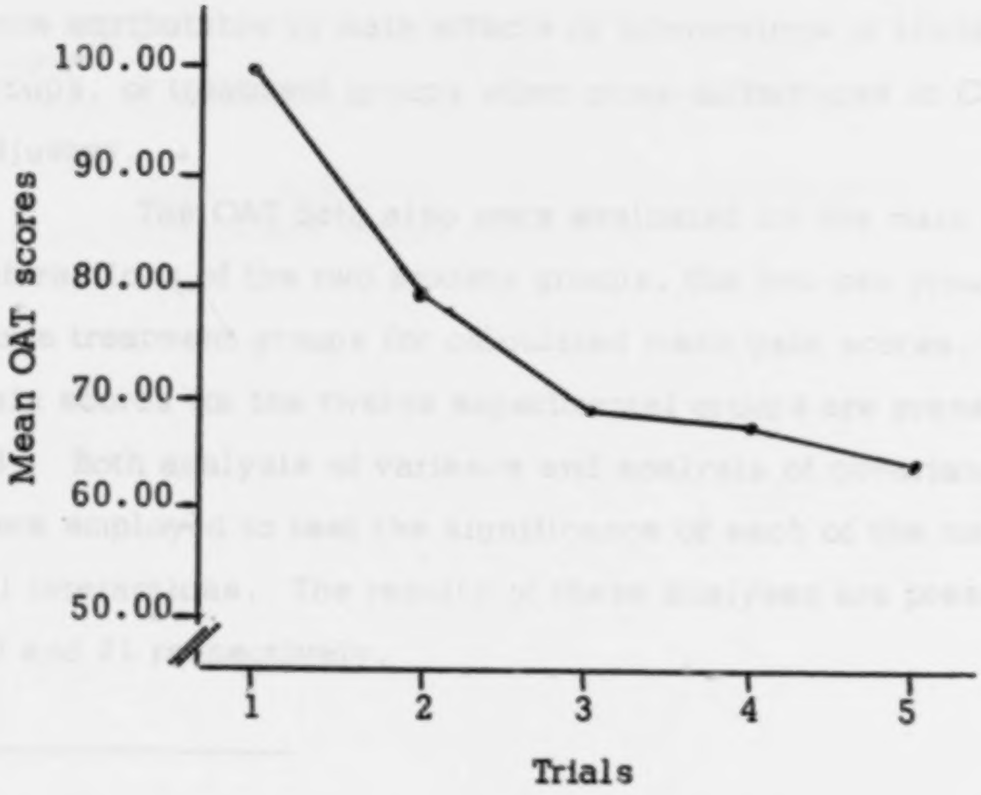

Figure 1

Mean Object Assembly Task (OAT) scores
for each of five learning trials

The first, second, and third order interactions for anxiety, sexes, and treatments over the five trials also were evaluated. These tests of significance are reported in Table 14. All of the resultant Fs were not significant. Therefore, statements about the trend of the OAT means in relation to trials did not need to be qualified by the particular level of any one of the main effects, and the two and three factors interactions for the separate trials were of the same form.

Since the anxiety groups differed significantly on both CA and MA, the OAT data were also evaluated by analysis of covariance procedures to adjust the sums of squares for group differences in CA and MA. A separate analysis of covariance was performed to test the main effects and interactions of the two anxiety groups, the two sex groups, and the three treatment groups for each trial of the Digit Substitution Task. The results of these analyses are reported in Tables 15, 16, 17, 18, and 19. Inspection of the five tables will reveal that all the resultant Fs were not significant. No differences were found in mean OAT performance attributable to main effects or interactions of anxiety groups, sex groups, or treatment groups when group differences in CA and MA were adjusted.

The OAT data also were evaluated for the main effects and interactions of the two anxiety groups, the two sex groups, and the three treatment groups for calculated mean gain scores.[1] The mean gain scores for the twelve experimental groups are presented in Table 13. Both analysis of variance and analysis of covariance procedures were employed to test the significance of each of the main effects and all interactions. The results of these analyses are presented in Tables 20 and 21 respectively.

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[1] The gain score is defined as the total raw score minus the number of trials times the raw score of the first trial. For the Object Assembly Task the gain score = the sum of the raw scores for trials 1, 2, 3, 4, and 5 minus 5 (raw score for trial 1).

TABLE 15

ANALYSIS OF COVARIANCE FOR TRIAL 1 OF THE OBJECT ASSEMBLY TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	4526.73	1	4526.73	2.63
Between Anxiety	5896.70	1	5896.70	3.43
Between Treatments	5456.51	2	2728.25	1.59
Interaction: Sexes X Anxiety	430.92	1	430.92	---
Interaction: Sexes X Treatments	1130.81	2	551.91	---
Interaction: Anxiety X Treatments	3710.86	2	1855.43	1.08
Interaction: Sexes X Anxiety X Treatments	2670.79	2	1335.40	---
Within Groups	99735.67	58	1719.58	
Total	123531.99	69		

Note: Reference to analysis of covariance throughout the study include both CA and MA as covariants.

TABLE 16

ANALYSIS OF COVARIANCE FOR TRIAL 2 OF THE OBJECT ASSEMBLY TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	2256.47	1	2256.47	2.02
Between Anxiety	1927.99	1	1927.99	1.73
Between Treatments	643.68	2	321.84	---
Interaction: Sexes X Anxiety	264.12	1	264.12	---
Interaction: Sexes X Treatments	76.98	2	38.49	---
Interaction: Anxiety X Treatments	39.21	2	19.61	---
Interaction: Sexes X Anxiety X Treatments	1814.11	2	907.05	---
Within Groups	64790.37	58	1117.08	
Total	71812.93	69		

TABLE 17

ANALYSIS OF COVARIANCE FOR TRIAL 3 OF THE OBJECT ASSEMBLY TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	1795.46	1	1795.46	3.25
Between Anxiety	347.46	1	347.46	---
Between Treatments	254.88	2	127.44	---
Interaction: Sexes X Anxiety	20.85	1	20.85	---
Interaction: Sexes X Treatments	199.28	2	99.64	---
Interaction: Anxiety X Treatments	247.44	2	123.72	---
Interaction: Sexes X Anxiety X Treatments	1223.25	2	611.63	1.11
Within Groups	32033.56	58	552.30	
Total	36122.18	69		

TABLE 18

ANALYSIS OF COVARIANCE FOR TRIAL 4 OF THE OBJECT ASSEMBLY TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	766.81	1	766.81	1.85
Between Anxiety	5.61	1	5.61	---
Between Treatments	615.37	2	307.69	---
Interaction: Sexes X Anxiety	17.63	1	17.63	---
Interaction: Sexes X Treatments	38.15	2	19.08	---
Interaction: Anxiety X Treatments	37.98	2	18.99	---
Interaction: Sexes X Anxiety X Treatments	1193.90	2	596.95	1.44
Within Groups	24009.91	58	413.96	
Total	26685.36	69		

TABLE 19

ANALYSIS OF COVARIANCE FOR TRIAL 5 OF THE OBJECT ASSEMBLY TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	265.26	1	265.26	---
Between Anxiety	731.40	1	731.40	2.07
Between Treatments	396.18	2	198.09	---
Interaction: Sexes X Anxiety	134.97	1	134.97	---
Interaction: Sexes X Treatments	31.28	2	15.64	---
Interaction: Anxiety X Treatments	463.53	2	231.77	---
Interaction: Sexes X Anxiety X Treatments	1015.83	2	507.92	1.43
Within Groups	20537.09	58	354.09	
Total	23575.54	69		

TABLE 20

ANALYSIS OF VARIANCE OF OBJECT ASSEMBLY GAIN SCORES FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	34003.97	1	34003.97	2.85
Between Anxiety	18563.43	1	18563.43	1.56
Between Treatments	32812.49	2	16406.25	1.38
Interaction: Sexes X Anxiety	189.81	1	189.81	---
Interaction: Sexes X Treatments	23066.64	2	11533.32	---
Interaction: Anxiety X Treatments	24299.88	2	12149.94	1.02
Interaction: Sexes X Anxiety X Treatments	38532.72	2	19266.36	1.62
Within Groups	714852.56	60	11914.21	
Total	886321.50	71		

TABLE 21

ANALYSIS OF COVARIANCE FOR GAIN SCORES OF THE OBJECT ASSEMBLY TASK OVER FIVE TRIALS FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	18298.17	1	18298.17	1.71
Between Anxiety	46310.17	1	46310.17	4.33*
Between Treatments	56313.68	2	28156.84	2.63
Interaction: Sexes X Anxiety	4849.05	1	4849.05	---
Interaction: Sexes X Treatments	16147.24	2	8073.62	---
Interaction: Anxiety X Treatments	53364.38	2	26682.19	2.49
Interaction: Sexes X Anxiety X Treatments	14254.38	2	7127.19	---
Within Groups	620997.86	58	10706.86	
Total	830534.93	69		

*Significant (df = 1 and 55, F .05 = 4.02)

The mean OAT gain score for experimental groups A, B, C, D, E, and F (high anxiety) was -99.67. The mean OAT gain score for groups G, H, I, J, K, and L (low anxiety) was -131.79. Table 20 reveals that the difference between means uncorrected for group differences in MA and CA was not significant (F = 1.56, df = 1 and 60, F .05 = 4.00). However, inspection of Table 21 reveals that the difference between means corrected for group differences in MA and CA was significant (F = 4.33, df = 1 and 55, F .05 = 4.02). There were differences in mean OAT gain scores between high and low anxiety groups when group differences in CA and MA were accounted for. It was concluded that the mean OAT gain scores were significantly higher for the low anxiety groups than for the high anxiety groups.

The main effects between sexes was tested by comparing the mean OAT gain score of groups A, B, C, G, H, and I (boys) with groups D, E, F, J, K, and L (girls). The mean OAT gain score of these groups was -94.00 and -137.46 respectively. Tables 20 and 21 reveal that the resultant Fs were not significant (F = 2.85, df = 1 and 60, F .05 = 4.00; F = 1.71, df = 1 and 55, F .05 = 4.02). There were no differences in mean OAT gain scores between the sexes.

The mean OAT gain scores for experimental groups A, D, G, and J (encouraged verbal treatment), groups B, E, H, and K (neutral treatment) and groups C, F, I, and L (discouraged verbal treatment) were -144.67, -93.82, and -108.70 respectively. Inspection of Tables 20 and 21 reveals that the differences between means were not significant (F = 1.38, df = 2 and 60, F .05 = 3.15; F = 2.63, df = 2 and 55, F .05 = 3.17). No differences existed in mean OAT gain scores among treatment groups.

The first and second order interactions for anxiety, sexes, and treatments were evaluated. These tests of significance are reported in Tables 20 and 21. All the resultant Fs were not significant. Therefore, statements about each of the main effects did not need to be qualified by the particular level of any one of the other factors involved, and the two factor interactions for the separate levels of the remaining factors were of the same form.

The F max test of homogeneity of variance was completed for all subjects assigned to the twelve experimental groups. The test was applied to determine if the assumption of homogeneity of variance underlying the analysis of variance technique had been achieved. The results of the F max test applied to OAT scores on each learning trial and the composite trial gain score are presented in Table 22.

Inspection of Table 22 reveals that the resultant F max for trial 1 was significant (F max = 50.44, k = 12, n = 5, F max .05 = 29.9). The F maxs of 232.75, 72.36, and 34.54 obtained for trials 2, 3 and 4 respectively also were significant at the .05 level (k = 12, n = 5, F max .05 = 29.9). The F max obtained for the OAT gain score also was significant (F max = 34.87, k = 12, n = 5, F max .05 = 29.9). Only the F max obtained for trial 5 was not significant (F max = 17.90, k = 12, n = 5, F max .05 = 29.9). It was concluded that significant differences in group variance existed for the twelve experimental groups for OAT scores on trials 1, 2, 3, and 4 and for the composite gain scores. The null hypothesis of no differences in variances was supported only for trial 5 of the Object Assembly Task.

TABLE 22

F MAX TEST OF HOMOGENEITY OF VARIANCE FOR OBJECT ASSEMBLY SCORES FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS OVER FIVE TRIALS

(N = 72)

Trial	Maximum Variance	Minimum Variance	k Mean Squares	n-1	F max
One	6041.96	119.79	12	5	50.44*
Two	6931.29	29.78	12	5	232.75*
Three	2694.08	37.23	12	5	72.36*
Four	1488.68	43.10	12	5	34.54*
Five	1049.97	58.67	12	5	17.90
Gain Score	51433.06	1474.97	12	5	34.87*

*Significant (k = 12 and n = 5, F max .05 = 29.9)

Since significant differences in CA and MA were found between anxiety groups (Tables 9 and 10), the F max test of homogeneity of variance also was completed for all subjects assigned to the six experimental groups resulting from the collapse of the anxiety factor and the classification of subjects into sex and treatment groups. The test was applied to determine if the assumption of homogeneity of variance underlying the analysis of variance technique had been achieved when anxiety grouping was eliminated. The results of the F max test applied to OAT scores for each learning trial and for the composite gain score are presented in Table 23.

TABLE 23

F MAX TEST OF HOMOGENEITY OF VARIANCE FOR OBJECT ASSEMBLY SCORES FOR SIX EXPERIMENTAL GROUPS OF EMR SUBJECTS OVER FIVE TRIALS

(N = 72)

Trial	Maximum Variance	Minimum Variance	k Mean Squares	n-1	F max
One	3975.34	365.96	6	11	10.86*
Two	3438.18	152.39	6	11	22.56*
Three	1504.12	86.65	6	11	17.36*
Four	774.23	169.93	6	11	4.56
Five	637.12	99.76	6	11	6.39*
Gain Score	30494.82	5868.92	6	11	5.20

*Significant (k = 6 and n = 12, F max .05 = 5.72)

Note: Where the table for the distribution of F max could not be entered at the exact k/n level, the table was entered at the next higher k/n level. The conservative procedure was followed throughout the study.

Inspection of Table 23 reveals that the resultant F max for trial 1 was significant (F max = 10.86, k = 6, n = 12, F max .05 = 5.72). The F maxs of 22.56, 17.36, and 6.39 obtained for trials 2, 3 and 5 respectively also were significant at the .05 level (k = 6, n = 12, F max .05 = 5.72). However, the F max values of 4.56 and 5.20 obtained for the OAT scores for trial 4 and the composite gain score respectively were not significant (k = 6, n = 12, F max .05 = 5.72). It was concluded that significant differences in group variances existed for the six experimental groups for OAT scores on trials 1, 2, 3, and 5. The null hypothesis of no differences in variance was supported for trial 4 and the composite gain score.

Since the analysis of covariance procedure is based upon the assumption that the regression lines for the various treatment groups all can be assumed to have a common slope, or to be parallel within the limits of random sampling, F values to test the underlying assumption were computed. The results of these tests for each trial of the OAT and for the composite gain score for all subjects assigned to the twelve experimental groups are presented in Table 24.

Inspection of Table 24 will reveal that the resultant F value for trial 1 of the OAT was significant (F = 6.95, df = 2 and 55, f .05 = 3.17). The F values of 5.23, 6.11, 3.59, and 6.30 obtained for trials 2, 3, 4, and 5 respectively also were significant at the .05 level (df = 2 and 55, F .05 = 3.17). The F value obtained for the composite OAT gain score also was significant (F = 4.53, df = 2 and 55, F .05 = 3.17). It was concluded that significant differences in regression lines existed for the twelve experimental groups for trials 1, 2, 3, 4, and 5 of the OAT and for the composite OAT gain score. The regression lines were not parallel within the limits of random sampling.

Summary of Object Assembly Task

Analysis of OAT data indicated that there were significant differences in mean performance related to the five learning trials.

TABLE 24

F VALUES TESTING THE ASSUMPTION OF PARALLEL REGRESSION LINES OF ANALYSIS OF COVARIANCE APPLIED TO OBJECT ASSEMBLY TASK SCORES FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Scores	df	F values
Trial One	2 and 58	6.95*
Trial Two	2 and 58	5.23*
Trial Three	2 and 58	6.11*
Trial Four	2 and 58	3.59*
Trial Five	2 and 58	6.30*
Gain Scores	2 and 58	4.53*

*Significant (df = 2 and 55, F .05 = 3.17)

Note: Where the table for the distribution of F could not be entered at the exact df, the table was entered at the next lower df level. The conservative procedure was followed throughout the study.

There were no differences in mean performance attributable to anxiety grouping, sex grouping, treatment conditions, or interaction of these variables independent of learning trials or related to the trials. No differences in mean OAT performance were found for any individual trial attributable to anxiety, sex, treatments, or interactions when group differences in CA and MA were considered. A significant difference in mean gain scores was found between anxiety groups when CA and MA were designated covariants. No other differences in mean gain score were found for sex grouping, treatment conditions, or interactions of anxiety, sex, and treatment. The F max tests for homogeneity of variance among the twelve experimental groups were significant for trials 1, 2, 3, and 4 and for gain score. The F max test was not significant for trial 5. The F max tests applied to six experimental groups resulting from collapsing the anxiety variable were significant for trials 1, 2, 3, and 5. The F max test was not significant for trial 4 or for the composite gain scores. The F values obtained to test for differences in regression lines between CA, MA, and OAT scores were significant for trials 1, 2, 3, 4, and 5 and for the composite gain score.

C. Digit Substitution Task

The second measure employed to test the main effects and interactions of the two anxiety groups, the three treatment groups, and the two sex groups was the mean score on the Digit Substitution Task (DST). The means for each of the twelve experimental groups are shown in Table 25.

TABLE 25

MEAN DIGIT SUBSTITUTION TASK SCORES FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 6 per group)

Group	Type	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Gain Score
A	HA-B-ES	19.83	21.00	24.67	23.33	25.50	15.17
B	HA-B-EN	18.50	19.33	23.00	22.83	25.00	16.17
C	HA-B-EF	15.83	18.50	19.67	19.83	21.00	15.67
D	HA-G-ES	22.83	23.50	25.17	25.67	29.17	12.17
E	HA-G-EN	21.67	25.00	24.83	22.50	25.50	11.17
F	HA-G-EF	16.83	19.00	22.67	24.83	26.00	25.17
G	LA-B-ES	24.33	28.17	28.00	30.83	33.17	22.67
H	LA-B-EN	25.17	24.17	27.67	27.33	29.17	7.67
I	LA-B-EF	19.83	20.83	20.17	21.33	22.83	5.83
J	LA-G-ES	24.17	23.83	25.00	24.17	26.50	2.83
K	LA-G-EN	20.50	22.00	21.83	22.17	23.67	7.67
L	LA-G-EF	24.50	26.50	28.33	29.33	30.33	16.50

An analysis of variance for trends of group means was completed to test the significance of each of the main effects and all interactions. The analysis also tested the significance of the trend in group means over the five learning trials independent of and related to the main effects and all interactions of anxiety, sex, and treatment. The results of these analyses are presented in Table 26.

The mean DST score for experimental groups A, B, C, D, E, and F (high anxiety) was 22.43. The mean DST score for experimental groups G, H, I, J, K, and L (low anxiety) was 25.19. Inspection of Table 26 reveals that the difference between means uncorrected for group differences in CA and MA was not significant (F = 3.42, df = 1 and 60, F .05 = 4.00).

The main effects between sexes was tested by comparing the mean DST score of groups A, B, C, G, H, and I (boys) with experimental groups, D, E, F, J, K, and L (girls). The mean DST score of these groups was 23.36 and 24.27 respectively. A test for signigicant difference in DST mean score between boys and girls is presented in Table 26. The resultant F was not significant (F<1.00, df = 1 and 60, F .05 = 4.00). There was no difference in mean DST score between the sexes.

The main effects among treatment groups was tested by comparing experimental groups A, D, G, and J (encouraged verbal treatment) with groups B, E, H, and K (neutral treatment) with groups C, F, I, and L (discouraged verbal treatment). The mean DST score for these groups was 25.44, 23.59, and 22.41 respectively. Inspection of Table 26 indicates that the resulting F was not significant (F = 1.40, df = 2 and 60, F .05 = 3.15). It was concluded that there was no difference in mean DST score among treatment groups.

The first and second order interactions for anxiety grouping, sex, and treatments also were evaluated. These tests of significance are reported in Table 26. The resultant F values were not significant. Therefore, statements about each of the main effects did not need to

TABLE 26

ANALYSIS OF VARIANCE OF TRENDS OF DIGIT SUBSTITUTION SCORES FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS OVER FIVE TRIALS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	73.81	1	73.81	---
Between Anxiety	686.14	1	686.14	3.42
Between Treatments	560.96	2	280.48	1.40
Interaction: Sexes X Anxiety	225.62	1	225.62	1.12
Interaction: Sexes X Treatments	702.07	2	351.04	1.75
Interaction: Anxiety X Treatments	88.82	2	44.41	---
Interaction: Sexes X Anxiety X Treatments	562.15	2	281.08	1.40
Error (a)	12051.77	60	200.86	
Between Trials	1164.74	4	291.18	44.32*
Interaction: Sexes X Trials	7.40	4	1.85	---
Interaction: Anxiety X Trials	44.35	4	11.09	1.69
Interaction: Treatments X Trials	48.54	8	6.07	---
Interaction: Sexes X Anxiety X Trials	18.75	4	4.69	---
Interaction: Sexes X Treatments X Trials	193.60	8	24.20	3.68*
Interaction: Anxiety X Treatments X Trials	28.74	8	3.59	---
Interaction: Sexes X Anxiety X Treatments X Trials	63.02	8	7.88	1.20
Error (b)	1576.06	240	6.57	
Total	18096.54	359		

*Significant (df = 4 and 200, F .05 = 2.41; df = 8 and 200, F .05 = 1.98) be qualified by the particular level of any one of the other factors involved, and the two factor interactions for the separate levels of the remaining factors were of the same form.

The DST data also were evaluated to test the significance of the trend in group means over the five learning trials independent of and related to the effects of anxiety, sex, treatment, and all interactions. The results of these analyses are presented in Table 26.

The mean DST score for trial 1, 2, 3, 4, and 5 was 21.17, 22.65, 24.25, 24.51, and 26.49 respectively. Inspection of Table 26 will reveal that the difference in DST means for trials was significant (F = 44.32, df = 4 and 200, F .05 = 2.41). Reference to Figure 2 will show the trend of mean DST scores was to increase with successive trials. The linear component of the trend was 1125.00. The test for the significance of the linear component of the over-all trend was significant (F = 171.23, df = 1 and 200, F .05 = 3.89). It was concluded that a significant change in mean DST scores occurred over the five trials and that the change was linear in form.

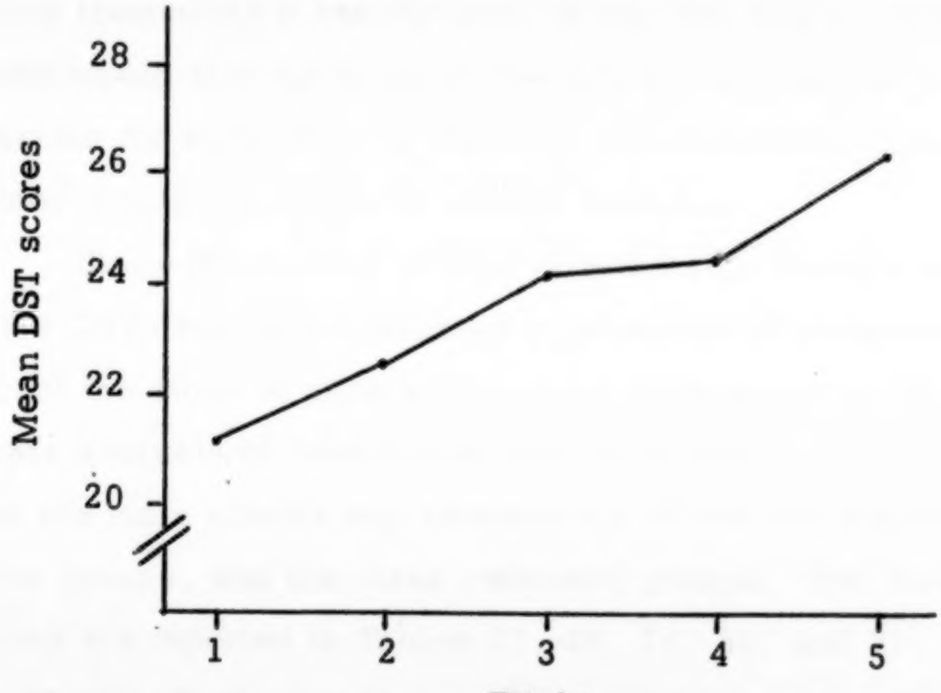

Figure 2

Mean Digit Substitution Task (DST) Scores
for each of five learning trials

The DST data were evaluated to test for differences in mean values for the first, second, and third order interactions for anxiety, sex, and treatment over the five learning trials. These tests of significance are reported in Table 26. Only the resultant F value for the second order interaction of sexes x treatments x trials was found to be significant at the .05 level (F = 3.68, df = 8 and 200, F .05 = 1.98). This significant triple factor interaction indicated that the trend of DST mean scores over the five learning trials was affected by the particular combination of sex and treatment factors. Reference to Figure 3 will show that the trends of the mean DST scores (trials 1, 2, 3, 4, and 5) for the treatment groups (C_1, C_2, and C_3) were not of the same form for the two sex groups (B_1 and B_2). The means plotted in the graphs in Figure 3 were obtained from values given in Table 25. The fact that the three factor interaction was significant indicated that the treatment x trials interaction for boys differed from the treatments x trials interaction for girls more than could be expected within the limits of random sampling. Because the sexes x treatments x trials interaction was symmetrical, it could also have been examined by graphing trials x sex for the various treatments, or by graphing treatments x sex for each of the five trials. These alternate methods would also have led to the conclusion that the second order interaction for each level of the third factor differed more than could be expected within the limits of random sampling.

Since the anxiety groups differed significantly on both CA and MA, the DST data were evaluated by analysis of covariance procedures to adjust the sums of squares for group differences in CA and MA. A separate analysis of covariance was performed for each trial of the DST to test the main effects and interactions of the two anxiety groups, the two sex groups, and the three treatment groups. The results of these analyses are reported in Tables 27, 28, 29, 30, and 31. Inspection of Table 27 will reveal that the resultant F for the main effects of anxiety for trial 1 was significant (F = 4.11, df = 1 and 55, F .05 = 4.02). No differences were found in mean DST performance for trial 1 attributable

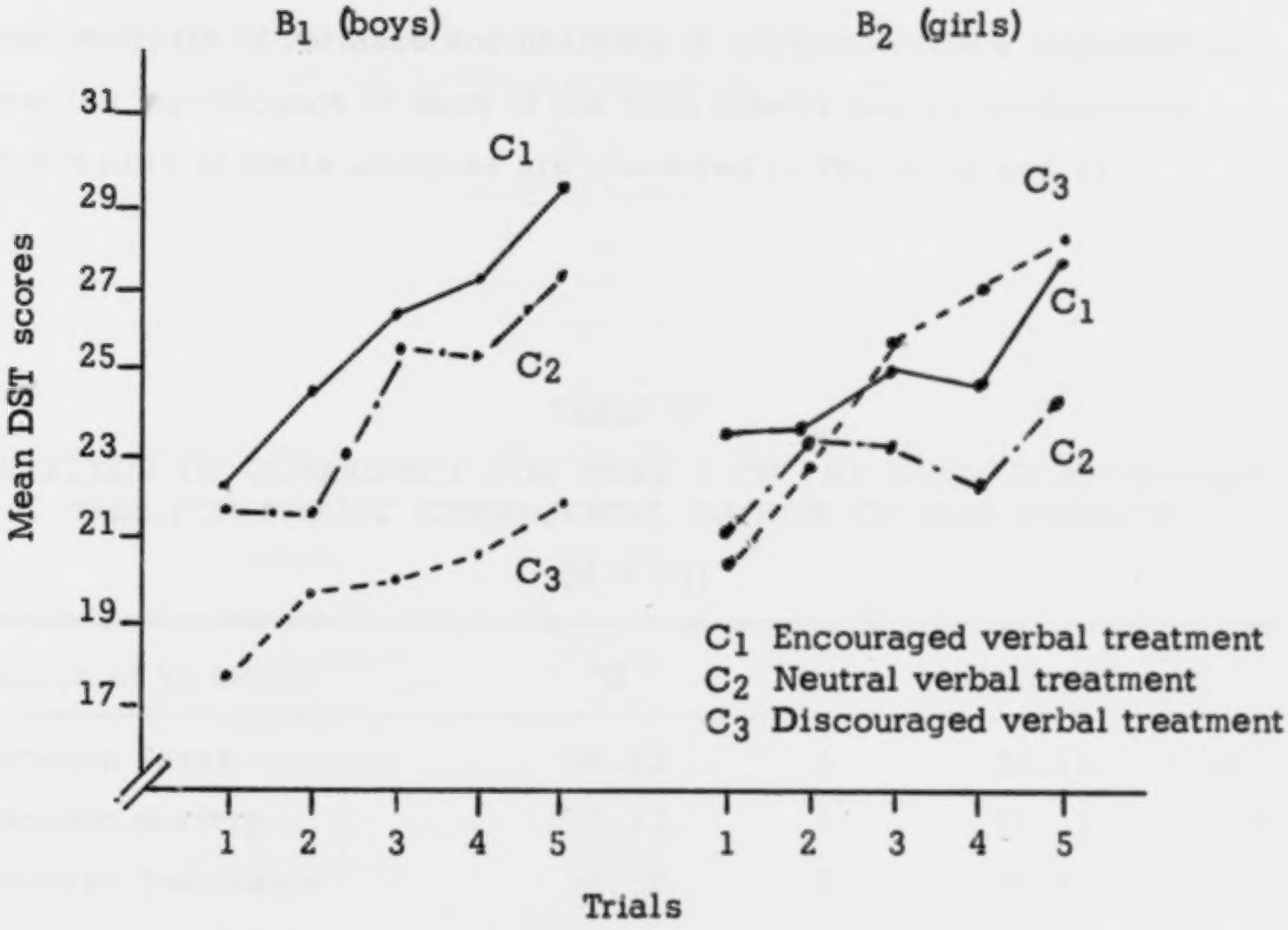

Figure 3

Digit Substitution Task (DST) means for levels of C (treatment) for each trial for B (sex).

to the main effects of sex or treatments or to the interactions of anxiety, sex, or treatments. It was concluded that the low anxiety groups performed at a significantly higher level on the first trial of the DST than did the high anxiety groups.

Inspection of Tables 28, 29, 30, and 31 will reveal that the resultant Fs were not significant. No differences were found in mean DST performance for trials 2, 3, 4, and 5 attributable to the main effects of anxiety level, sexes, treatments, or interactions of the three factors.

The DST data also were converted into gain scores and evaluated for the main effects and interactions of the two anxiety groups, the two sex groups, and the three treatment groups. The mean gain scores for each of the twelve experimental groups are presented in Table 25. Both analysis of variance and analysis of covariance were employed to test the significance of each of the main effects and all interactions. The results of these analyses are presented in Tables 32 and 33.

TABLE 27

ANALYSIS OF COVARIANCE FOR TRIAL 1 OF THE DIGIT SUBSTITUTION TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	34.13	1	34.13	1.20
Between Anxiety	117.33	1	117.33	4.11*
Between Treatments	90.92	2	45.46	1.59
Interaction: Sexes X Anxiety	8.38	1	8.38	---
Interaction: Sexes X Treatments	18.57	2	9.28	---
Interaction: Anxiety X Treatments	28.83	2	14.41	---
Interaction: Sexes X Anxiety X Treatments	29.11	2	14.55	---
Within Groups	1655.31	58	28.54	
Total	1982.58	69		

*Significant (df = 1 and 55, F .05 = 4.02)

TABLE 28

ANALYSIS OF COVARIANCE FOR TRIAL 2 OF THE DIGIT SUBSTITUTION TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	29.89	1	29.89	1.02
Between Anxiety	45.63	1	45.63	1.56
Between Treatments	43.13	2	21.56	---
Interaction: Sexes X Anxiety	21.85	1	21.85	---
Interaction: Sexes X Treatments	41.45	2	20.73	---
Interaction: Anxiety X Treatments	5.25	2	2.63	---
Interaction: Sexes X Anxiety X Treatments	46.37	2	23.18	---
Within Groups	1701.88	58	29.34	
Total	1935.45	69		

TABLE 29

ANALYSIS OF COVARIANCE FOR TRIAL 3 OF THE DIGIT SUBSTITUTION TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	3.19	1	3.19	---
Between Anxiety	1.97	1	1.97	---
Between Treatments	55.76	2	27.88	---
Interaction: Sexes X Anxiety	12.01	1	12.01	---
Interaction: Sexes X Treatments	121.23	2	60.62	1.26
Interaction: Anxiety X Treatments	11.23	2	5.62	---
Interaction: Sexes X Anxiety X Treatments	24.93	2	12.46	---
Within Groups	2782.96	58	47.98	
Total	3013.28	69		

TABLE 30

ANALYSIS OF COVARIANCE FOR TRIAL 4 OF THE DIGIT SUBSTITUTION TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	2.24	1	2.24	---
Between Anxiety	16.76	1	16.76	---
Between Treatments	35.17	2	17.59	---
Interaction: Sexes X Anxiety	36.16	1	36.16	---
Interaction: Sexes X Treatments	209.59	2	104.79	2.38
Interaction: Anxiety X Treatments	18.28	2	9.14	---
Interaction: Sexes X Anxiety X Treatments	57.03	2	28.52	---
Within Groups	2553.63	58	44.03	
Total	2928.86	69		

TABLE 31

ANALYSIS OF COVARIANCE FOR TRIAL 5 OF THE DIGIT SUBSTITUTION TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	3.78	1	3.78	---
Between Anxiety	7.29	1	7.29	---
Between Treatments	94.10	2	47.05	---
Interaction: Sexes X Anxiety	72.92	1	72.92	1.49
Interaction: Sexes X Treatments	170.30	2	85.15	1.74
Interaction: Anxiety X Treatments	6.91	2	3.46	---
Interaction: Sexes X Anxiety X Treatments	69.16	2	34.58	---
Within Groups	2833.14	58	48.85	
Total	3257.60	69		

TABLE 32

ANALYSIS OF VARIANCE OF DIGIT SUBSTITUTION GAIN SCORES FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	29.38	1	29.38	---
Between Anxiety	522.72	1	522.72	3.17
Between Treatments	315.19	2	157.60	---
Interaction: Sexes X Anxiety	56.90	1	56.90	---
Interaction: Sexes X Treatments	1400.20	2	700.10	4.24*
Interaction: Anxiety X Treatments	211.70	2	105.85	---
Interaction: Sexes X Anxiety X Treatments	407.68	2	203.84	1.23
Within Groups	9904.67	60	165.08	
Total	12848.44	71		

*Significant (df = 2 and 60, F .05 = 3.15)

TABLE 33

ANALYSIS OF COVARIANCE FOR GAIN SCORES OF THE DIGIT SUBSTITUTION TASK OVER FIVE TRIALS FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	157.66	1	157.66	1.07
Between Anxiety	811.36	1	811.36	5.52*
Between Treatments	411.69	2	205.85	1.40
Interaction: Sexes X Anxiety	120.88	1	120.88	---
Interaction: Sexes X Treatments	933.60	2	466.80	3.18*
Interaction: Anxiety X Treatments	251.20	2	125.60	---
Interaction: Sexes X Anxiety X Treatments	635.65	2	317.82	2.16
Within Groups	8522.72	58	146.94	
Total	11844.76	69		

*Significant (df = 1 and 55, F .05 = 4.02; df = 2 and 55, F .05 = 3.17)

The mean DST gain score for experimental groups A, B, C, D, E, and F (high anxiety) was 15.92. The mean DST gain score for experimental groups G, H, I, J, K, and L (low anxiety) was 10.53. Table 32 reveals that the difference between the means uncorrected for group differences in CA and MA was not significant (F = 3.17, df = 1 and 60, F .05 = 4.00). However, inspection of Table 33 reveals that the difference between means adjusted for group differences in CA and MA was significant (F = 5.52, df = 1 and 55, F .05 = 4.02). There was a difference in mean DST gain scores between high and low anxiety groups when group differences in CA and MA were controlled. It was concluded that mean

DST gain score was significantly higher for the high anxiety group than for the low anxiety group.

The main effects between sexes was tested by comparing the mean DST gain score of groups A, B, C, G, H, and I (boys) with groups D, E, F, J, K, and L (girls). The mean DST gain score of these groups was 13.86 and 12.58 respectively. Tables 32 and 33 reveal that the resultant Fs were not significant (F =<1.00, df = 1 and 60, F .05 = 4.00; F = 1.07, df = 1 and 55, F .05 = 4.02). There was no difference in mean DST gain score attributable to the main effects of sex.

The mean DST gain score for experimental groups A, D, G, and J (encouraged verbal treatment), groups B, E, H, and K (neutral treatment), and groups C, F, I, and L (discouraged verbal treatment) was 13.21, 10.67, and 15.79 respectively. Inspection of Tables 32 and 33 will reveal that the differences between mean DST gain scores were not significant (F =<1.00, df = 2 and 60, F .05 = 3.15; F = 1.40, df = 2 and 55, F .05 = 3.17). There were no differences in mean DST gain scores attributable to the main effects of treatments.

The first and second order interactions for anxiety level, sexes, and treatments also were evaluated. These tests of significance are presented in Tables 32 and 33. Inspection of Tables 32 and 33 will reveal that only the F for the first order interaction of sexes x treatments was significant (f = 4.24, df = 2 and 60, F .05 = 3.15; F = 3.18, df = 2 and 55, F .05 = 3.17). This significant double factor interaction indicated that mean DST gain score was affected by the particular combination of sex and treatment factors. Reference to Figure 4 will show that the mean DST gain scores for treatment groups (C_1, C_2, and C_3) were not of the same form for the two sex groups (B_1 and B_2). The means plotted in Figure 4 were obtained from values given in Table 25. The fact that the two factor interaction was significant indicates that the mean DST gain scores for treatments for boys differed from the mean DST gain scores for treatments for girls more than could have been expected within the limits of random sampling. Because the sexes x

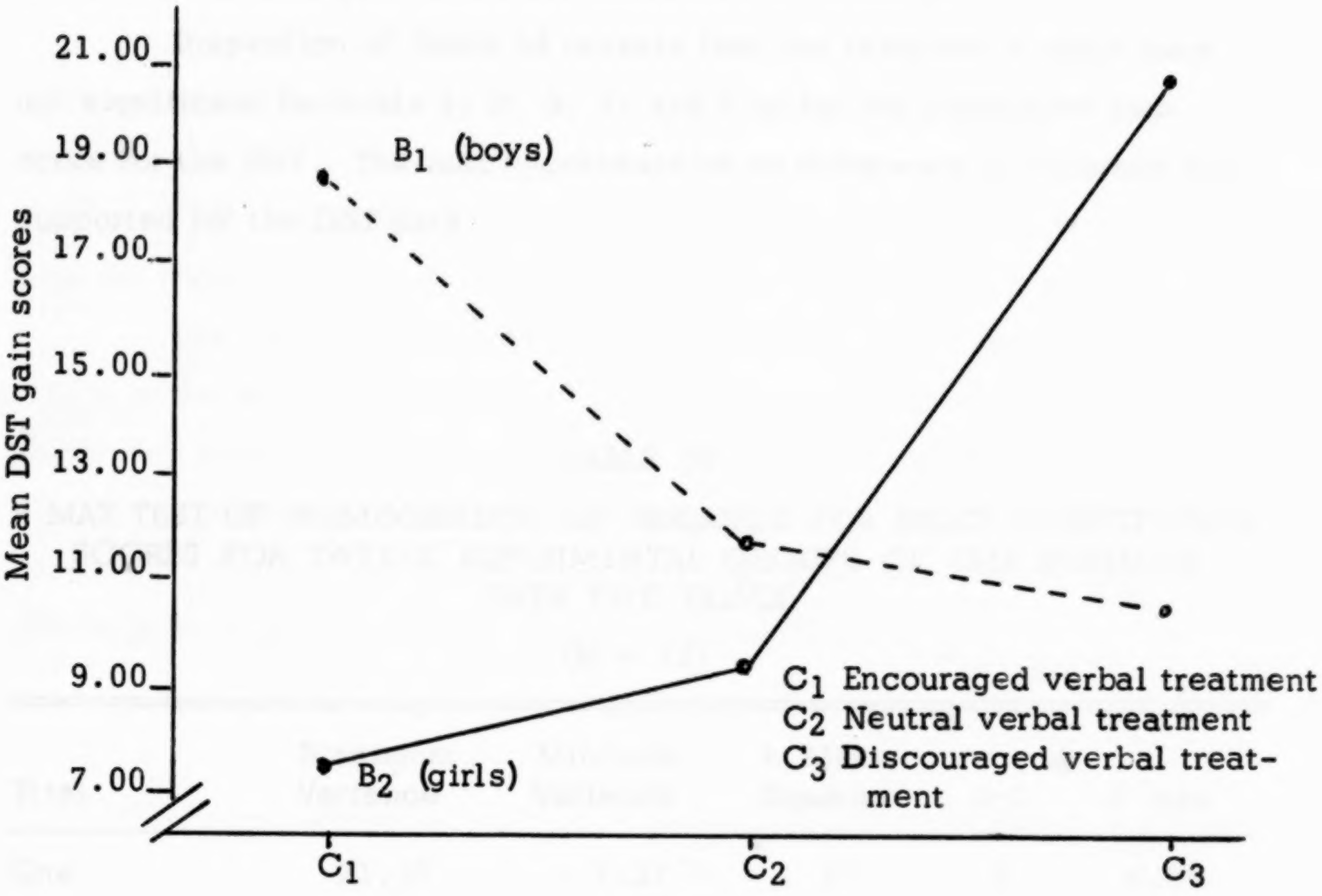

Figure 4

Mean Digit Substitution Task (DST) gain scores for levels of B(sex) at each level of C (treatment conditions).

treatments interaction was symmetrical, it could also have been examined by graphing treatments for each of the sex groups. This alternate method would also have led to the conclusion that the first order interaction for each level of the second factor differed more than could have been expected within the limits of random sampling.

The F max test of homogeneity of variance was completed for all subjects assigned to the twelve experimental groups. The test was applied to determine if the assumption of homogeneity of variance underlying the analysis of variance technique had been achieved. The results of the F max test applied to DST scores for each learning trial and the composite gain score are presented in Table 34.

Inspection of Table 34 reveals that the resultant F maxs were not significant for trials 1, 2, 3, 4, and 5 or for the composite gain score for the DST. The null hypothesis of no difference in variance was supported for the DST data.

TABLE 34

F MAX TEST OF HOMOGENEITY OF VARIANCE FOR DIGIT SUBSTITUTION SCORES FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS OVER FIVE TRIALS

(N = 72)

Trial	Maximum Variance	Minimum Variance	k Mean Squares	n-1	F max
One	71.37	7.37	12	5	9.68
Two	60.80	8.57	12	5	7.09
Three	86.67	19.37	12	5	4.47
Four	112.57	9.37	12	5	12.01
Five	147.20	12.97	12	5	11.35
Gain Score	489.37	23.77	12	5	20.59

Since significant differences in CA and MA were found between anxiety groups (Tables 9 and 10), the F max test of homogeneity of variance also was computed for all subjects assigned to the six experimental groups resulting from the collapse of the anxiety variable and the classification of subjects into sex and treatment groups. The test was applied to determine if the assumption of homogeniety of variance underlying the analysis of variance technique had been achieved when anxiety grouping was eliminated. The results of the F max test applied to DST scores for each learning trial and for the composite gain score are presented in Table 35.

Inspection of Table 35 reveals that the resultant F max values were not significant (F max = $<$4.15, k = 6, n = 12, F max .05 = 5.72). It was concluded that differences in group variances did not exist. The null hypothesis of no difference in variance was supported for the DST data for trials 1, 2, 3, 4, and 5 and for the composite gain score.

The analysis of covariance technique is based upon the assumption that the repression lines for the various treatment groups are parallel within the limits of random sampling. The F values necessary to test for significant differences between the slopes of the regression lines were computed. The results of these analyses for each trial and for the composite gain score of the DST are presented in Table 36.

TABLE 35

F MAX TEST OF HOMOGENEITY OF VARIANCE FOR DIGIT SUBSTITUTION SCORES FOR SIX EXPERIMENTAL GROUPS OF EMR SUBJECTS OVER FIVE TRIALS

(N = 72)

Trial	Maximum Variance	Minimum Variance	k Mean Squares	n-1	F max
One	45.79	24.27	6	11	1.89
Two	47.91	30.21	6	11	1.59
Three	64.43	43.33	6	11	1.49
Four	67.54	33.54	6	11	2.01
Five	88.45	43.24	6	11	2.05
Gain Score	367.54	88.99	6	11	4.13

TABLE 36

F VALUES TESTING THE ASSUMPTION OF PARALLEL REGRESSION LINES OF ANALYSIS OF COVARIANCE APPLIED TO DIGIT SUBSTITUTION TASK SCORES FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

DST Scores	df	F Values
Trial One	2 and 58	4.41*
Trial Two	2 and 58	7.35*
Trial Three	2 and 58	4.80*
Trial Four	2 and 58	6.20*
Trial Five	2 and 58	5.15*
Gain Scores	2 and 58	4.70*

*Significant (df = 2 and 55, F .05 = 3.17)

Inspection of Table 36 will reveal that the resulting F value for trial 1 of the DST was significant (F = 4.41, df = 2 and 55, F .05 = 3.17). The F values of 7.35, 4.80, 6.20, and 5.15 obtained for trials 2, 3, 4, and 5 respectively also were significant at the .05 level (df = 2 and 55, F .05 = 3.17). The F value obtained for the composite DST gain score also was significant (F = 4.70, df = 2 and 55, F .05 = 3.17). It was concluded that significant differences in regression lines existed for the twelve experimental groups for trials 1, 2, 3, 4, and 5 of the DST and for the composite DST gain score. The regression lines were not parallel within the limits of random sampling.

Summary of Digit Substitution Task

Analysis of DST data indicated that there were significant differences in mean performance related to the five learning trials. The trend of mean DST scores related to the verbal treatments differed significantly for boys and girls. There were no differences in mean performance attributable to anxiety level, sex grouping, treatment conditions, or interactions of these variables independent of learning trials. Except for the sexes x trials x treatments interaction, the first, second, and third order interactions were not significant. When group differences in CA and MA were considered, a significant difference in mean performance was found between high and low anxiety groups on the first trial of the DST. This significant difference in anxiety group means was not found for the remaining four trials. No significant differences were found for any trial related to sex grouping, treatment conditions, or interactions of the three factors. A significant difference in mean gain scores related to treatment conditions was found between boys and girls. A significant difference in mean gain scores was found attributable to anxiety grouping when group differences in CA and MA were controlled. No other differences in mean gain scores were found for sex, treatment conditions, or interactions. The null hypothesis of no differences in variances among the twelve experimental groups was supported. The F max tests applied to six experimental groups resulting from collapsing the anxiety factor were not significant. The F values obtained to test for differences in regression lines between CA, MA, and DST scores were significant for trials 1, 2, 3, 4, and 5 and for the composite gain score.

D. Concept Identification Task

The third measure employed to test the main effects and interactions of the two anxiety groups, the three treatment groups, and the two sex groups was the mean score on the Concept Identification Task (CIT). The means for each of the twelve experimental groups are shown in Table 37.

An analysis of variance for trends of group means was completed to test the significance of each of the main effects and all

TABLE 37

MEAN CONCEPT IDENTIFICATION TASK SCORES FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 6 per group)

Group	Type	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Gain Score
A	HA-B-ES	2.67	3.17	3.33	3.67	3.67	3.67	4.17
B	HA-B-EN	3.17	3.67	3.67	3.83	4.00	4.00	3.33
C	HA-B-EF	3.33	4.67	4.67	4.67	5.17	5.17	7.67
D	HA-G-ES	3.00	3.33	4.17	4.33	4.83	4.67	6.33
E	HA-G-EN	4.00	4.67	5.00	6.33	6.83	6.83	9.67
F	HA-G-EF	2.50	2.33	2.50	2.67	2.67	2.83	.50
G	LA-B-ES	4.50	6.50	7.00	7.33	7.50	7.83	13.67
H	LA-B-EN	3.00	4.17	4.67	4.67	4.83	4.83	8.17
I	LA-B-EF	3.50	4.50	4.50	5.17	5.00	5.00	6.67
J	LA-G-ES	2.67	2.67	3.67	3.83	3.67	4.00	4.50
K	LA-G-EN	1.83	2.50	4.00	4.00	4.33	4.17	9.83
L	LA-G-EF	2.17	2.50	3.00	3.17	3.17	3.17	4.00

interactions. The analysis also tested the significance of the trend in group means over the six learning trials independent of and related to the main effects and all interactions of anxiety level, sex grouping, and treatment conditions. The results of these analyses are presented in Table 38.

The mean CIT score for experimental groups A, B, C, D, E, and F (high anxiety) was 3.99. The mean CIT score for experimental groups G, H, I, J, K, and L (low anxiety) was 4.25. Inspection of Table 38 will reveal that the difference between means uncorrected for group differences in CA and MA was not significant ($F < 1.00$, df = 1 and 60, $F_{.05} = 4.00$).

The main effects of sex was tested by comparing the mean CIT score of groups A, B, C, G, H, and I (boys) with experimental groups D, E, F, J, K, and L (girls). The mean CIT score of these groups was

TABLE 38

ANALYSIS OF VARIANCE OF TRENDS OF CONCEPT IDENTIFICATION SCORES FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS OVER SIX TRIALS (N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	89.84	1	89.84	3.61
Between Anxiety	7.00	1	7.00	---
Between Treatments	46.26	2	23.13	---
Interaction: Sexes X Anxiety	130.77	1	130.77	5.25*
Interaction: Sexes X Treatments	113.51	2	56.76	2.28
Interaction: Anxiety X Treatments	83.26	2	41.63	1.67
Interaction: Sexes X Anxiety X Treatments	87.26	2	43.63	1.75
Error (a)	1494.58	60	24.91	
Between Trials	147.38	5	29.48	44.00*
Interaction: Sexes X Trials	6.73	5	1.35	2.01
Interaction: Anxiety X Trials	5.96	5	1.19	1.78
Interaction: Treatments X Trials	9.30	10	.93	1.39
Interaction: Sexes X Anxiety X Trials	3.58	5	.72	1.07
Interaction: Sexes X Treatments X Trials	15.04	10	1.50	2.24*
Interaction: Anxiety X Treatments X Trials	3.74	10	.37	---
Interaction: Sexes X Anxiety X Treatments X Trials	8.85	10	.89	1.33
Error (b)	199.92	300	.67	
Total	2452.98	431		

*Significant (df = 1 and 60, F .05 = 4.00; df = 5 and 200, F .05 = 2.26; df = 10 and 200, F .05 = 1.87)

4.57 and 3.66 respectively. A test for significant difference in CIT mean score between boys and girls is presented in Table 38. The resultant F was not significant (F = 3.61, df = 1 and 60, F .05 = 4.00). There was no difference in mean CIT score between the sex groups.

The main effects among treatment groups was tested by comparing experimental groups A, D, G, and J (encouraged verbal treatment) with groups B, E, H, and K (neutral treatment) with groups C, F, I, and L (discouraged verbal treatment). The mean CIT score for these groups was 4.40, 4.29, and 3.66 respectively. Inspection of Table 38 indicates that the resulting F was not significant ($F < 1.00$, df = 2 and 60, F .05 = 3.15). It was concluded that there were no differences in mean CIT scores among treatment groups.

The first and second order interactions for anxiety grouping, sexes, and treatment conditions also were evaluated. These tests of significance are reported in Table 38. Only the resultant F value for the first order interaction of sexes x anxiety was found to be significant at the .05 level (F = 5.25, df = 1 and 60, F .05 = 4.00). This significant two factor interaction indicated that mean CIT score was effected by the particular combination of sex and anxiety factors. Reference to Figure 5 will show that the mean CIT scores for anxiety groups (A_1 and A_2) were not of the same form for the two sex groups (B_1 and B_2). The means plotted in Figure 5 were obtained from values given in Table 37. The fact that the two factor interaction was significant indicated that the mean CIT scores for anxiety grouping differed for boys and girls more than could be expected within the limits of random sampling. Because the sexes x anxiety interaction was symmetrical, it could also have been examined by graphing anxiety level for each of the sex groups. This alternate method would also have led to the conclusion that the first order interaction for each level of the second factor differed more than could have been expected within the limits of random sampling.

The CIT data also were evaluated to test the significance of the trend in group means over the six learning trials independent of and

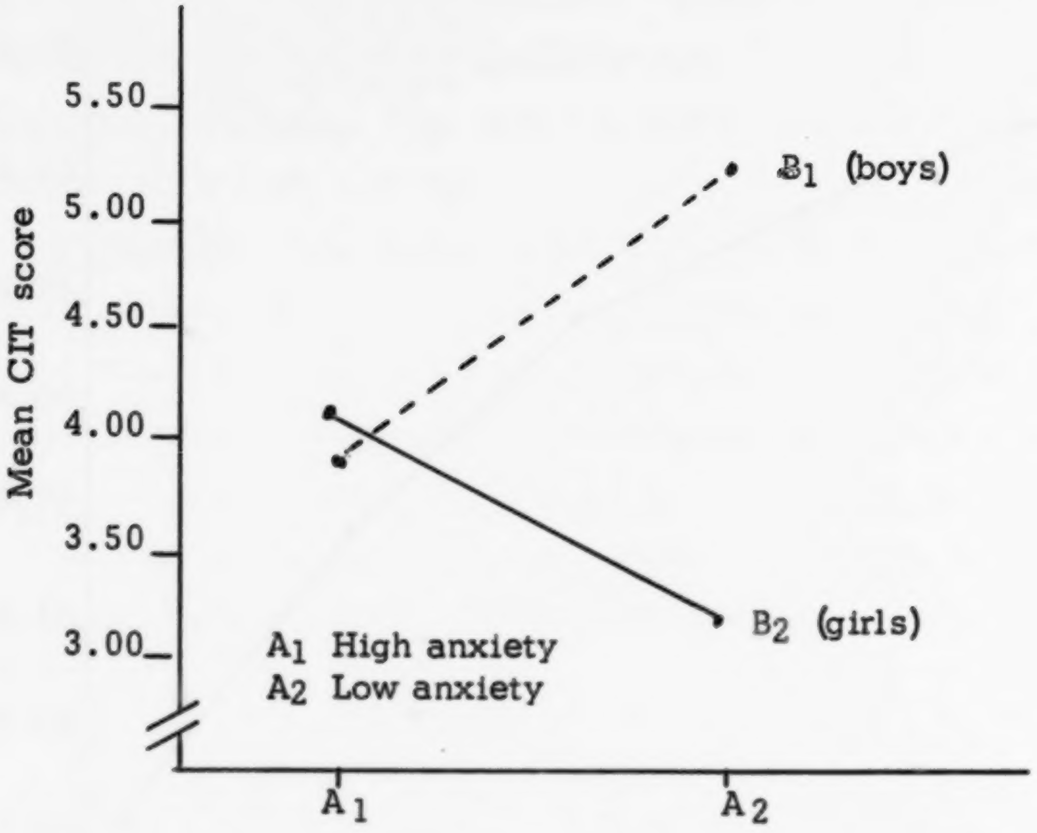

Figure 5

Concept Identification Task (CIT) means for levels of A (anxiety) at each level of B (sex).

related to the effects of anxiety, sex, treatment, and all interactions. The results of these analyses are presented in Table 38.

The mean CIT scores for trials 1, 2, 3, 4, 5, and 6 were 3.03, 3.72, 4.18, 4.47, 4.64, and 4.67 respectively. Inspection of Table 38 will reveal that the difference in CIT means for trials was significant ($F = 44.00$, df = 5 and 200, $F_{.05} = 2.26$). Reference to Figure 6 will show the trend of mean CIT scores was to increase with successive trials. The linear component of the trend was 129.86. The test for the significance of the linear component of the over-all trend was significant ($F = 193.82$, df = 1 and 200, $F_{.05} = 3.89$). It was concluded that

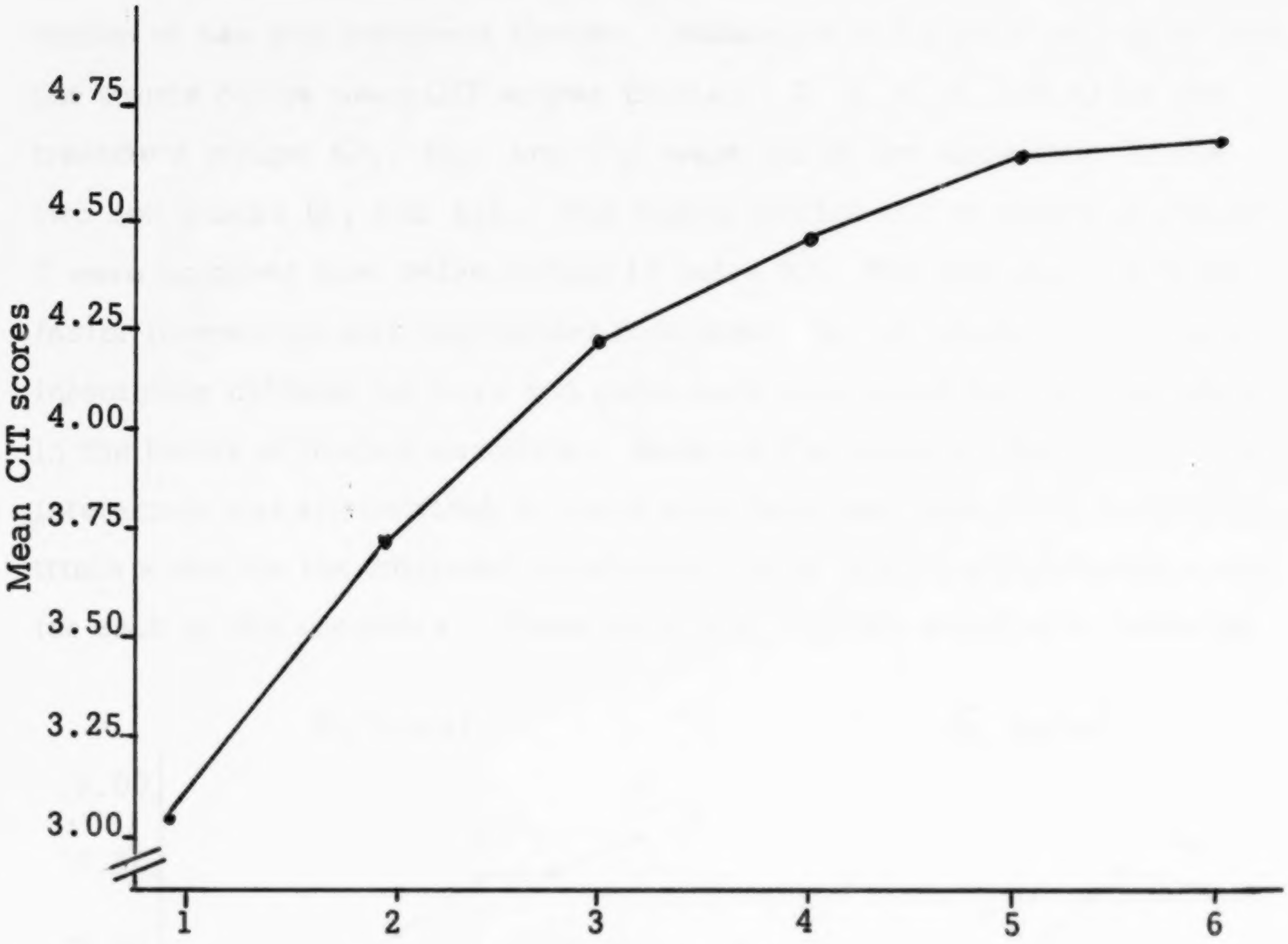

Figure 6

Mean Concept Identification Task (CIT) scores for each of six learning trials.

a significant change in mean CIT scores occurred over the six trials and that the change was linear in form.

The CIT data were evaluated to test for differences in mean values for the first, second, and third order interactions for anxiety, sex, and treatment over the six learning trials. These tests of significance are reported in Table 38. Only the resultant F value for the second order interaction of sexes x treatments x trials was found to be significant at the .05 level (F = 2.24, df = 10 and 200, F .05 = 1.87). This significant triple factor interaction indicated that the trend of CIT mean scores over the six learning trials was effected by the particular combination of sex and treatment factors. Reference to Figure 7 will show that the trends of the mean CIT scores (trials 1, 2, 3, 4, 5, and 6) for the treatment groups (C_1, C_2, and C_3) were not of the same form for the two sex groups (B_1 and B_2). The means plotted in the graphs in Figure 7 were obtained from values given in Table 37. The fact that the three factor interaction was significant indicated that the treatments x trials interaction differed for boys and girls more than could be expected within the limits of random sampling. Because the sexes x treatments x trials interaction was symmetrical, it could also have been examined by graphing trials x sex for the treatment conditions, or by graphing treatments x sex for each of the six trials. These alternate methods would also have led

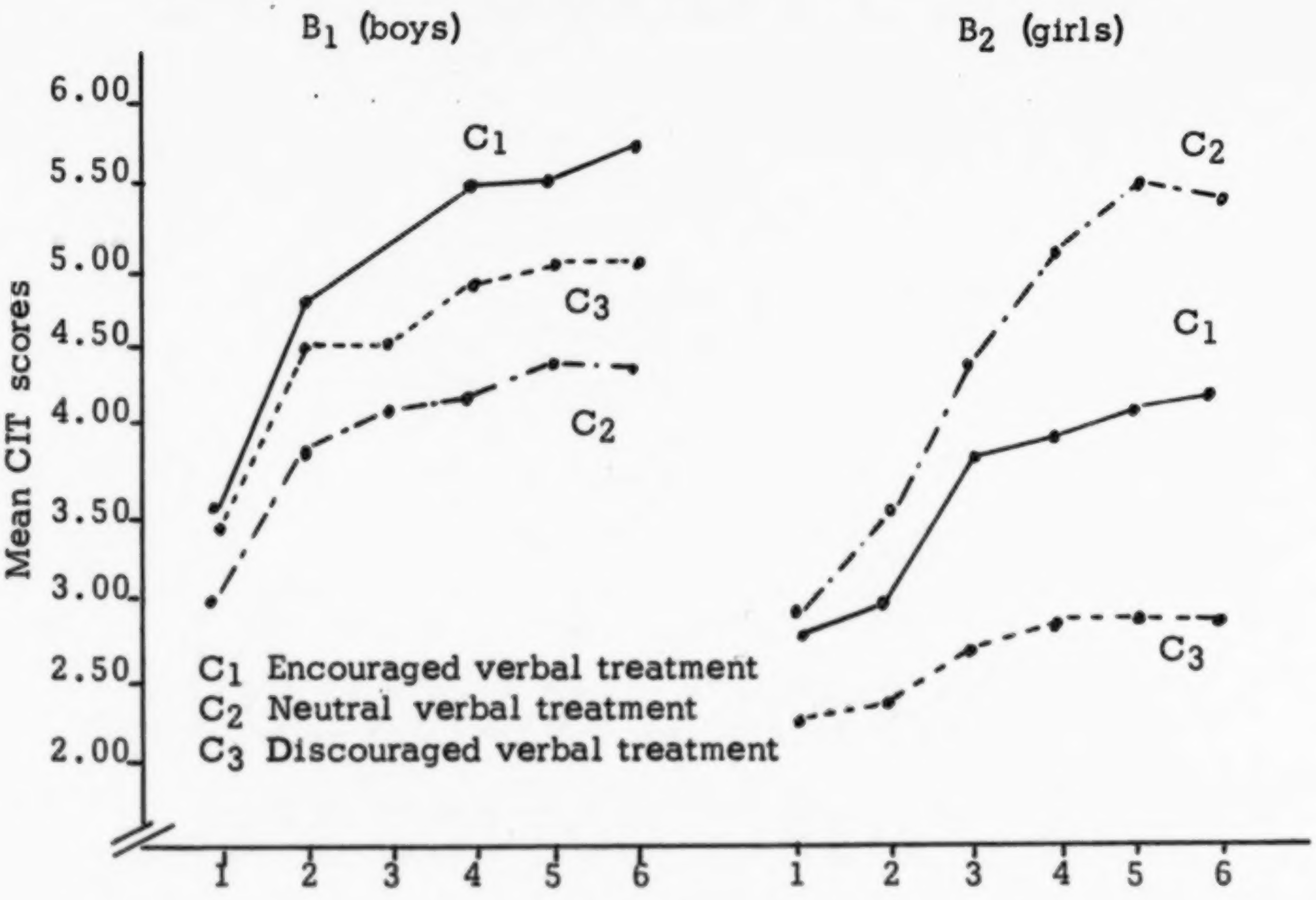

Figure 7

Concept Identification Task (CIT) means for levels of C (treatment) for each trial for B (sex).

to the conclusion that the second order interaction for each level of the third factor differed more than could have been expected within the limits of random sampling.

Since the anxiety groups differed significantly on both CA and MA, the CIT data were evaluated by analysis of covariance procedures to adjust the sums of squares for group differences in CA and MA. A separate analysis of covariance was performed for each trial of the CIT to test the main effects and interactions of the two anxiety groups, the two sex groups, and the three treatment conditions. The results of these analyses are reported in Tables 39, 40, 41, 42, 43, and 44.

TABLE 39

ANALYSIS OF COVARIANCE FOR TRIAL 1 OF THE CONCEPT IDENTIFICATION TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	S	df	Mean SS	F
Between Sexes	1.85	1	1.85	---
Between Anxiety	5.69	1	5.69	1.39
Between Treatments	.33	2	.17	---
Interaction: Sexes X Anxiety	2.86	1	2.86	---
Interaction: Sexes X Treatments	4.75	2	2.38	---
Interaction: Anxiety X Treatments	2.85	2	1.42	---
Interaction: Sexes X Anxiety X Treatments	.01	2	.01	---
Within Groups	236.57	58	4.08	
Total	254.91	69		

Inspection of Tables 39 and 41 will reveal that all the resultant Fs were not significant. Inspection of Table 40 will reveal that the resultant F for the main effects of sex for trial 2 of the CIT was significant (F = 4.43, df = 1 and 55, F .05 = 4.02). No differences were found for trial 2 in mean CIT performance attributable to the main effects of anxiety or treatments or to the interactions of the three factors. It was concluded that boys performed at a higher level than girls on the second trial of the CIT.

TABLE 40

ANALYSIS OF COVARIANCE FOR TRIAL 2 OF THE CONCEPT IDENTIFICATION TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	20.75	1	20.75	4.43*
Between Anxiety	.84	1	.84	---
Between Treatments	.70	2	.35	---
Interaction: Sexes X Anxiety	8.34	1	8.34	1.78
Interaction: Sexes X Treatments	15.61	2	7.81	1.67
Interaction: Anxiety X Treatments	5.99	2	2.99	---
Interaction: Sexes X Anxiety X Treatments	5.99	2	2.99	---
Within Groups	271.86	58	4.69	
Total	330.08	69		

*Significant (df = 1 and 55, F .05 = 4.02)

TABLE 41

ANALYSIS OF COVARIANCE FOR TRIAL 3 OF THE CONCEPT IDENTIFICATION TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	6.94	1	6.94	1.69
Between Anxiety	1.09	1	1.09	---
Between Treatments	5.76	2	2.88	---
Interaction: Sexes X Anxiety	6.60	1	6.60	1.61
Interaction: Sexes X Treatments	18.51	2	9.26	2.26
Interaction: Anxiety X Treatments	5.31	2	2.65	---
Interaction: Sexes X Anxiety X Treatments	9.62	2	4.81	1.17
Within Groups	237.81	58	4.10	
Total	291.64	69		

TABLE 42

ANALYSIS OF COVARIANCE FOR TRIAL 4 OF THE CONCEPT IDENTIFICATION TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	7.13	1	7.13	1.65
Between Anxiety	.44	1	.44	---
Between Treatments	7.78	2	3.89	---
Interaction: Sexes X Anxiety	17.36	1	17.36	4.01*
Interaction: Sexes X Treatments	32.77	2	16.39	3.79*
Interaction: Anxiety X Treatments	8.46	2	4.23	---
Interaction: Sexes X Anxiety X Treatments	7.51	2	3.76	---
Within Groups	250.82	58	4.32	
Total	332.27	69		

*Significant (df = 1 and 55, F .05 = 4.02; df = 2 and 55, F = 3.17)

TABLE 43

ANALYSIS OF COVARIANCE FOR TRIAL 5 OF THE CONCEPT IDENTIFICATION TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	4.99	1	4.99	1.20
Between Anxiety	.15	1	.15	---
Between Treatments	11.52	2	5.76	1.38
Interaction: Sexes X Anxiety	17.59	1	17.59	4.23*
Interaction: Sexes X Treatments	41.12	2	20.56	4.94*
Interaction: Anxiety X Treatments	6.57	2	3.28	---
Interaction: Sexes X Anxiety X Treatments	15.00	2	7.50	1.80
Within Groups	241.22	58	4.16	
Total	338.16	69		

*Significant (df = 1 and 55, F .05 = 4.02; df = 2 and 55, F .05 = 3.17)

TABLE 44

ANALYSIS OF COVARIANCE FOR TRIAL 6 OF THE CONCEPT IDENTIFICATION TASK FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	7.03	1	7.03	1.67
Between Anxiety	.18	1	.18	---
Between Treatments	10.85	2	5.42	1.29
Interaction: Sexes X Anxiety	20.20	1	20.20	4.81*
Interaction: Sexes X Treatments	41.37	2	20.68	4.92*
Interaction: Anxiety X Treatments	12.22	2	6.11	1.45
Interaction: Sexes X Anxiety X Treatments	11.04	2	5.52	1.31
Within Groups	243.75	58	4.20	
Total	346.64	69		

*Significant (df = 1 and 55, F .05 = 4.02; df = 2 and 55, F .05 = 3.17)

Inspection of Tables 42, 43, and 44 reveal that the resultant Fs for the main effects of anxiety level, sex grouping, and treatment conditions were not significant. The tests of significant differences in group means attributable to the first order interaction of sexes x anxiety resulted in signigicant Fs (F = 4.01, 4.23, and 4.81, df = 1 and 55, F .05 = 4.02). This significant two factor interaction indicated that mean CIT score was effected by the particular combination of sex and anxiety factors. The fact that the two factor interaction was significant indicated that the mean CIT scores for anxiety groups differ for boys and girls more than could have been expected within the limits of random sampling.

The CIT data also were converted into gain scores and evaluated for the main effects and interactions of the anxiety grouping, sexes, and treatment conditions. The mean gain scores for each of the twelve experimental groups are presented in Table 37. Both analysis of variance and analysis of covariance were employed to test the significance of each of the main effects and all interactions. The results of these analyses are presented in Tables 45 and 46.

The mean CIT gain score for experimental groups A, B, C, D, E, and F (high anxiety) was 5.28. The mean CIT gain score for experimental groups G, H, I, J, K, and L (low anxiety) was 7.81. Table 45 reveals that the difference between the means not adjusted for group differences in CA and MA was not significant (F = 3.34, df = 1 and 60, F .05 = 4.00). However, inspection of Table 46 reveals that the difference between means adjusted for group differences in CA and MA was significant (F = 4.12, df = 1 and 55, F .05 = 4.02).

The main effects between sexes was tested by comparing the mean CIT gain score for groups A, B, C, G, H, and I (boys) with experimental groups D, E, F, J, K, and L (girls). The mean CIT score of these groups was 7.28 and 5.81 respectively. Tables 45 and 46 reveal that the resultant Fs were not significant (F = 1.13, df = 1 and 60, F .05 = 4.00; F = 2.84, df = 1 and 55, F .05 = 4.02). There were no differences in mean CIT gain score attributable to sex.

The mean CIT gain score for experimental groups A, D, G, and J (encouraged verbal treatment), groups B, E, H, and K (neutral treatment) and groups C, F, I, and L (discouraged verbal treatment) was 7.17, 7.75, and 4.71 respectively. Inspection of Tables 45 and 46 will reveal that the resultant Fs were not significant (F = 1.81, df = 2 and 60, F .05 = 3.15; F = 2.04, df = 2 and 55, F .05 = 3.17). There were no differences in mean CIT gain scores attributable to the main effects of treatment conditions.

TABLE 45

ANALYSIS OF VARIANCE OF CONCEPT IDENTIFICATION GAIN SCORES FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	39.01	1	39.01	1.13
Between Anxiety	115.01	1	115.01	3.34
Between Treatments	125.08	2	62.54	1.81
Interaction: Sexes X Anxiety	66.13	1	66.13	1.92
Interaction: Sexes X Treatments	275.53	2	137.76	4.00*
Interaction: Anxiety X Treatments	20.03	2	10.02	---
Interaction: Sexes X Anxiety X Treatments	189.58	2	94.79	2.75
Within Groups	2067.50	60	34.46	
Total	2897.87	71		

*Significant (df = 2 and 60, F .05 = 3.15)

TABLE 46

ANALYSIS OF COVARIANCE FOR GAIN SCORES OF THE CONCEPT IDENTIFICATION TASK OVER SIX TRIALS FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

(N = 72)

Source of Variation	SS	df	Mean SS	F
Between Sexes	63.14	1	63.14	1.84
Between Anxiety	141.54	1	141.54	4.12*
Between Treatments	140.06	2	70.03	2.04
Interaction: Sexes X Anxiety	97.01	1	97.01	2.82
Interaction: Sexes X Treatments	253.63	2	126.81	3.69*
Interaction: Anxiety X Treatments	26.08	2	13.04	---
Interaction: Sexes X Anxiety X Treatments	222.50	2	111.25	3.24*
Within Groups	1993.38	58	34.37	
Total	2937.34	69		

*Significant (df = 1 and 55, F .05 = 4.02; df = 2 and 55, F .05 = 3.17)

The first and second order interactions for anxiety level, sexes, and treatments also were evaluated. These tests of significance are reported in Tables 45 and 46.

Inspection of Tables 45 and 46 will reveal that the resultant Fs for the first order interaction of sexes x treatments were significant (F = 4.00, df = 2 and 60, F .05 = 3.15; F = 3.69, df = 2 and 55, F .05 = 3.17). The significant double factor interaction indicated that mean CIT gain score was affected by the particular combination of sex and treatment factors. Reference to Figure 8 will show that the mean CIT gain scores for treatment groups (C_1, C_2, and C_3) were not of the same

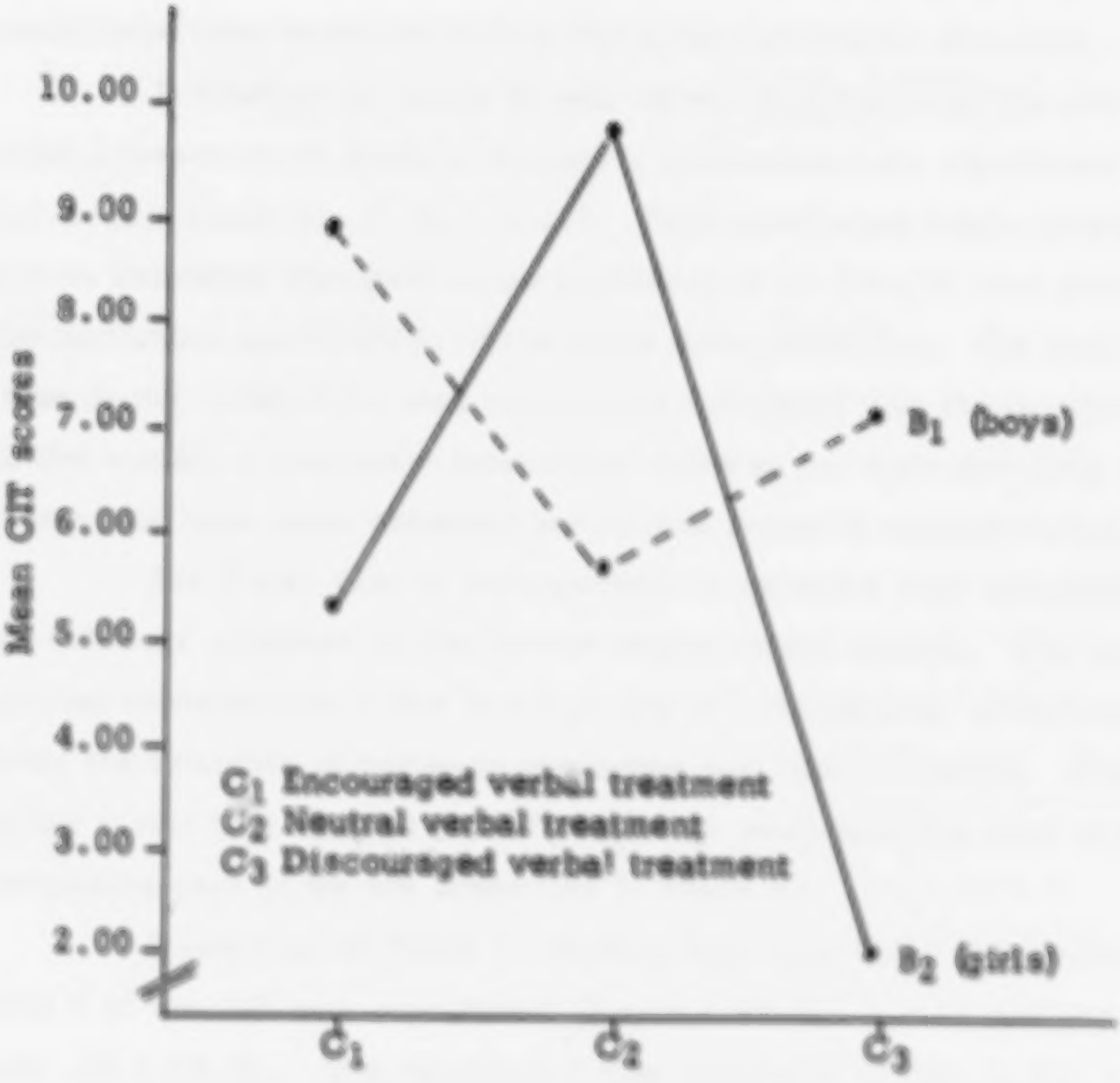

Figure 8

Concept Identification Task (CIT) mean for levels of B (sex) at each level of C (treatment conditions)

form for the two sex groups (B_1 and B_2). The means plotted in Figure 8 were obtained from values given in Table 37. The fact that the two factor interaction was significant indicated that the mean CIT gain scores for treatment conditions differed for boys and girls more than could have been expected within the limits of random sampling. Because the sexes x treatments interaction was symmetrical, it could also have been examined by graphing treatments for each of the sex groups. This alternate method would also have had to the conclusion that the first order interaction for each level of the second factor differed more than could have been expected within the limits of random sampling.

Inspection of Table 46 will reveal that the F for the second order interaction of sexes x anxiety x treatments was significant (F = 3.24, df = 2 and 55, F .05 = 3.17). This significant triple factor interaction indicated that gain score performance on the CIT was affected by the particular combination of the three main variables. The fact that the three factor interaction was significant indicated that the configuration of the anxiety x treatment interaction differed for boys and girls more than could have been expected within the limits of random sampling.

The F max test of homogeneity of variance was completed for all subjects assigned to the twelve experimental groups. The test was applied to determine if the assumptions of homogeneity of variance underlying the analysis of variance technique had been achieved. The results of the F max test applied to CIT scores for each learning trial and for the composite gain score are presented in Table 47.

Inspection of Table 47 reveals that only the F max value for trial 6 of the CIT was significant (F max = 48.65, k = 12 and n = 5, F max .05 = 29.9). The resultant F max values of 10.00, 9.76, 6.56, 12.34, 11.81, and 21.75 for trials 1, 2, 3, 4, and 5 and for the composite gain score respectively were not significant (k = 12 and n = 5, F max .05 = 29.9). The null hypothesis of no difference in variance was supported for the CIT data with the exception of the data for trial 6.

The F max test of homogeneity of variance also was completed for all subjects assigned to the six experimental groups formed by collapsing the anxiety variable and classifying of subjects into sex and treatment groups. The test was applied to determine if the assumption of homogeneity of variance underlying the analysis of variance technique had been achieved when anxiety grouping was eliminated. The results of the F max test applied to CIT scores for each learning trial and for the composite gain score for six experimental groups are presented in Table 48.

TABLE 47

F MAX TEST OF HOMOGENEITY OF VARIANCE FOR CONCEPT IDENTIFICATION SCORES FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS OVER SIX TRIALS

(N = 72)

Trial	Maximum Variance	Minimum Variance	k Mean Squares	n-1	F max
One	8.00	.80	12	5	10.00
Two	9.47	.97	12	5	9.76
Three	7.87	1.20	12	5	6.56
Four	8.27	.67	12	5	12.34
Five	8.27	.70	12	5	11.81
Six	8.27	.17	12	5	48.65*
Gain Score	273.37	12.57	12	5	21.75

*Significant (k = 12 and n = 5, F max .05 = 29.9)

TABLE 48

F MAX TEST OF HOMOGENEITY OF VARIANCE FOR CONCEPT IDENTIFICATION SCORES FOR SIX EXPERIMENTAL GROUPS OF EMR SUBJECT OVER SIX TRIALS

(N = 72)

Trial	Maximum Variance	Minimum Variance	k Mean Squares	n-1	F max
One	7.24	2.08	6	11	3.48
Two	7.90	2.63	6	11	3.01
Three	7.79	3.18	6	11	2.45
Four	7.73	2.99	6	11	2.58
Five	8.08	2.99	6	11	2.70
Six	8.57	3.54	6	11	2.42
Gain Score	64.27	19.84	6	11	3.24

Inspection of Table 48 will reveal that the resulting F max values were not significant (F max <3.50, $k = 6$, $n = 12$, F max $.05 = 5.72$). It was concluded that differences in group variances did not exist for the six experimental groups. The null hypothesis of no difference in variance was supported for the CIT data for trials 1, 2, 3, 4, 5, and 6 and for the composite gain score.

The assumption of parallel regression lines underlying the analysis of covariance technique was also tested. The F values required to test for significant differences between the slopes of the regression lines were computed. The results of these analyses are presented in Table 49.

TABLE 49

F VALUE TESTING THE ASSUMPTION OF PARALLEL REGRESSION LINES OF ANALYSIS OF COVARIANCE APPLIED TO CONCEPT IDENTIFICATION TASK SCORES FOR TWELVE EXPERIMENTAL GROUPS OF EMR SUBJECTS

($N = 72$)

CIT Scores	df	F value
Trial One	2 and 58	6.43*
Trial Two	2 and 58	5.10*
Trial Three	2 and 58	3.99*
Trial Four	2 and 58	2.29
Trial Five	2 and 58	3.34*
Trial Six	2 and 58	3.80*
Gain Score	2 and 58	1.08

*Significant (df = 2 and 55, F .05 = 3.17).

Inspection of Table 49 will reveal that the resultant F values of 2.29 and 1.08 for trial 4 and the composite gain score respectively were not significant (df = 2 and 55, F .05 = 3.17). The F values of 6.43, 5.10, 3.99, 3.34, and 3.80 obtained for trials 1, 2, 3, 5, and 6 respectively were significant (df = 2 and 55, F .05 = 3.17). It was concluded that significant differences in regression lines existed for the twelve experimental groups for trials 1, 2, 3, 5, and 6 of the CIT. The regression lines were not parallel within the limits of random sampling. Significant differences in regression lines did not exist for trial 4 and the composite gain score. The regression lines were parallel within the limits of random sampling for trial 4 and for the composite gain score of the CIT.

Summary of Concept Identification Task

Analysis of CIT data indicated that there were significant differences in mean performance related to the interaction of the anxiety and sex factors independent of learning trials. There were significant differences in performance related to the six learning trials. The trend in mean CIT scores related to treatments differed significantly for boys and girls. There were no differences in mean CIT performance attributable to sex groups, anxiety levels, or treatment conditions independent of trials. Except for the single sexes x anxiety interaction and the sexes x treatments x trials interaction, first, second, and third order interactions were not significant. When group differences in CA and MA were considered, an isolated significant difference in mean CIT performance was found between high and low anxiety groups for trial 2 of the CIT. This significant main effect was not found for the other five trials. Two significant first order interactions were found for trials 4, 5, and 6--sexes x anxiety interaction and sexes x treatments interaction. No other significant differences were found for the main effects or interactions of anxiety, sex, and treatment. A significant difference in mean CIT gain score was found for anxiety groups when group differences in CA and MA were controlled. The sexes x treatments interaction and sexes x anxiety x treatments interaction were found to be significant. No other differences in mean gain score were found for sex or treatment conditions. The F max tests for homogeneity of variance were not significant with the exception of the test applied to the CIT scores for trial 6. When applied to six experimental groups formed by eliminating the anxiety classification all the resulting F max values were not significant. The F values obtained to test for differences in regression lines between the various treatment groups were significant for trials 1, 2, 3, 5, and 6. The assumption of parallel regression lines was supported for trial 4 and the CIT composite gain score.

IV. DISCUSSION

A. Introduction

The findings of this study are not clearly discernable due to the failure to consistently support the assumptions underlying the statistical procedures available to test the differences between group means for the twelve experimental groups. The finding of significant differences in CA and MA between high and low anxiety groups led to the decision to employ analysis of covariance procedures to test for differences in group means. However, the analysis of covariance technique rests upon the assumption that the relationship between the covariant measure (X) and the dependent measure (Y) is positive and linear (Edwards, 1962, p. 285). The majority of the results obtained from employing analysis of covariance techniques cannot be appropriately interpreted due to the failure to meet the assumption underlying the procedure. The failure to meet the underlying assumption prevented the testing of several hypotheses derived from the questions posed by this investigation. The findings of this study, as set forth in Chapter III, may best be discussed as they relate to the specific questions posed earlier in this study.

B. Integration of Results with Research and Theory

1. Questions Posed by the Study

Question 1. Are there differences in performance on the experimental tasks related to the types of verbal demands for performance delivered by an authority figure?

No differences were found among the three treatment conditions for two of the three experimental tasks, namely Digit Substitution and Concept Identification. The heterogeneity of variance found among the twelve experimental groups for the Object Assembly Task cautions against reaching the same conclusions for that experimental task.[1] The finding of no differences among the three treatment conditions for two of the three experimental tasks held for the trend of the mean performance over the learning trials as well as for the composite gain score.

The finding of no differences in mean performance among the three treatment conditions was strengthened when the anxiety factor was eliminated and the test of homogeneity of variance was applied to the six experimental groups formed by the sex and treatment factors. The elimination of the two anxiety groups was necessary due to the failure to control group differences in CA and MA by analysis of covariance procedures. Since differences in CA and MA were not found among treatment groups or between sex groups, the realignment of subjects into sex and treatment groups permitted the use of analysis of variance procedures. The realignment of subjects into six experimental groups also reduced the heterogeneity of variance for the Object Assembly Task. The finding of no differences among the three treatment conditions for trial 4 and for the composite gain score of the Object Assembly Task, when added to similar findings for the other two learning tasks, strengthens the conclusion that there were no differences in performance on the experimental tasks related to the type of verbal demands for performance delivered by an authority figure.

The finding of no differences among treatment conditions is a significant finding of the present investigation. The failure of retarded children to perform at a higher level under the encouraging verbal treatment and to perform at a lower level under the discouraging verbal treatment relative to performance under the neutral treatment, contrary to certain postulates derived from expectancy theory and empirical evidence, is to be noted.

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[1] Edwards (1962, p. 132), however, states, " . . . since the F test is very insensitive to nonnormality and since with equal n's it is also insensitive to variance inequalities, it would be best to accept the fact that it can be used safely under most conditions."

In the current investigation the verbal treatments either failed to produce a performance expectation in the mentally retarded subjects relative to the novel learning tasks or, if an expectancy was formed, the expectancy failed to influence performance on the three experimental tasks. In either case, the results are inconsistent with Cromwell's (1963, pp. 41-91) interpretation of expectancy theory. However, empirical evidence supporting the establishment of a situational expectancy in mentally retarded children appears to be based primarily upon investigations involving shifts in aspiration level rather than measurable changes in performance on an experimental task (Cromwell, 1963, pp. 41-91; Blackman and Kahn, 1963, pp. 751-757). Sufficient evidence exists to question the relationship between a subject's stated aspiration level for a given task and actual performance on the task.

Tyler (1958, pp. 166-172), employing verbal comments similar to those used in the present study, concluded that a situational expectancy was formed and that the expectancy once formed influenced performance on a novel task. Aronson and Carlsmith (1962, pp. 178-182), employing a different procedure, reached the same conclusions. Similar results were not obtained from the current investigation. However, both previous studies employed nonretarded subjects and both provided means by which subjects could judge their performance. It may be that the mentally retarded children in the present study could not form an expectancy due to the absence of a means by which they could judge their performance against the examiner's verbal statements. Nonempirical evidence supporting this hypothesis is provided by the comments elicited by the verbal statements. It was not unusual for a subject to ask how he was doing or how he had done on one trial compared to a previous trial or how he had done compared to other subjects.

Empirical support for the proposed hypothesis is provided by Ellis and Distefano, Jr. (1959, pp. 486-490) who found rotary pursuit performance of mentally retarded subjects to be significantly higher under verbal urging and praise than under the absence of verbal urging and praise. Although their study was not designed to establish a performance expectation, the urging and praise statements were similar in content and delivery to the statements used in the encouraging verbal treatment in the present study. The absence of verbal urging and praise group was similar to the neutral treatment group in the present study. Their study did not include a group similar to the discouraging verbal treatment group. Their procedures included informing the subjects of their scores on the task following each trial. It may be that what has been termed a performance expectation in the present study was formed in the Ellis and Distefano study and influenced performance on the experimental task. If this occurred, it may have been the result of the performance feedback included in the design. Feedback may have provided reinforcement to the verbal comments issued by the examiners.

The current investigation included the assumption that performance consistent with performance expectations conveyed by the verbal statements delivered by an authority figure would have reinforcement value to mentally retarded subjects. The reinforcement would consist of pleasing the authority figure. The finding of no differences in performance on the experimental tasks among the three treatment groups may be the result of an error in this assumption. The retarded subjects in the present study may not have viewed the examiner as an authority figure or, if he was viewed as an authority figure, the reinforcement value of performance consistent with stated performance expectations may not have been of sufficient value to result in altered performance on the experimental tasks.

Atkinson (1957, p. 360), who would disagree with the simplicity of the expectancy model employed in the present study, has stated:

> The strength of motivation to perform some act is assumed to be a multiplicative function of the strength of the motive, the expectancy (subjective probability) that the act will have as a consequence the attainment of an incentive, and the value of the incentive: Motivation = f (Motive x Expectancy x Incentive).

The current investigation assumed that the attainment of praise as a result of pleasing the authority figure by performance consistent with the verbal statements would provide incentive to the mentally retarded subjects. The assumption may have been incorrect.

Some evidence supporting the notion that the assumptions concerning incentive may have been incorrect was obtained from the present study. The discouraging verbal treatment elicited several types of reactions including denial, e.g. to the statement: "I know this is too hard for you" (EF-2, f.) subjects responded with the comments, "It is"? and "No it ain't." A number of subjects receiving discouraging statements following the first trial of the Object Assembly Task seemed surprised and stood up to work the remaining trials. It appeared that many subjects reacted to the discouraging treatment with determination to improve their performance relative to the comments. It may be that the subjects viewed praise as restricted to an improvement in performance rather than related to performance consistent with the examiner's statements of performance expectations. If this is a valid hypothesis then the discouraging treatment may have resulted not in the establishment of a performance expectation but in an increase in the motive value (Atkinson, 1957, pp. 359-372) of achieving a performance level higher than the level previously obtained in anticipation that praise would then occur.

A similar possibility may exist for the performance of subjects assigned to the neutral treatment group. The comments elicited by the lack of verbal comments following a trial on one of the experimental tasks included questions related to the subjects' performance relative to performance on the previous trial. A number of subjects appeared to become flustered by the lack of verbal comment and gave the impression of increased effort on the next trial.

The encouraging verbal treatment also elicited comments suggesting that subjects viewed the comments as indicating the examiner's disappointment with the subject's performance, e. g. to the statement: "Fine but I think you can do better this next time" (ES-2, g.) the comment, "I'll try" was recorded. It may be that the three performance expectation conditions, rather than create different expectancies, were viewed by the subjects as requiring increased effort to obtain a performance level that would result in the issuance of praise. If this occurred, all three treatments would contribute to the motive value and result in increased effort on the experimental tasks.

It would seem that the establishment of a performance expectation in mentally retarded subjects that would influence performance has yet to be verified. Perhaps the use of a criterion measure against which the subject's performance can be judged, a procedure that has received both empirical and nonempirical support, would increase the likelihood that an expectancy would be formed. It would also seem reasonable to assume that the establishment of a performance expectation may be related to the value with which the mentally retarded subject views the individual issuing performance expectations. Perhaps the issuance of statements concerning performance expectations by the subject's teacher over a period of time would increase the likelihood that a performance expectation would be formed and once formed would effect actual performance.

Reed (1960, p. 151) has stated: "The concept that the demanding teacher may be an effective teacher is not new, but little attempt has been made to test the idea." It seems reasonable to assume that the teacher is an important adult to many children, including mentally retarded children. It also seems reasonable that the teacher, as the initiator of many novel tasks, may impart her performance expectations to her pupils in the form of reinforcement for acceptable and unacceptable performance. It may be that a child who is exposed to the teacher's performance expectations, who receives reinforcement, both negative and positive, for performance consistent or inconsistent with teacher's expectations, and who is exposed to the learning situation for a period of time, incorporates the teacher's expectations and attempts to perform at a level consistent with these expectations.

It is also to be noted that the majority of the subjects employed in the present study were children from lower socio-economic strata. No attempt was made to control for the possible influence of a social class variable. It may be that the verbal statements were not particularly meaningful to the subjects because of the social class factor. It seems reasonable to assume that the extent to which language is effective in altering behavior may be related to the extent to which language has been used to alter behavior in other situations, including child rearing situations. The verbal mediation of behavior may be meaningful to certain socio-economic strata and less meaningful to other strata. It would seem that socio-economic stratum may be an important but frequently overlooked independent variable. However, the extent to which the social class variable may have contributed to the lack of significant differences among treatment groups in the present study must await additional investigation.

Johnson's (1962, pp. 67-69) assumption that demands for performance create a stress situation that facilitates learning was not tested by the results obtained relative to the first question posed by this investigation. However, the comments elicited by the verbal treatments provide some nonempirical support to the notion that performance demands are stressful. The test of Johnson's assumption will result from the findings relative to the fifth question posed by the study. Differences in performance related to the interaction effect of anxiety level and verbal treatment will provide the evidence necessary to test Johnson's assumption. The alternate explanation, namely that differences in performance result from performance expectations communicated to the mentally retarded subject, was not supported by this investigation.

Question 2. Are there differences in performance on the experimental tasks related to the manifest anxiety level of the subject?

The second question cannot be answered by the present investigation. The significant differences in CA and MA between high and low anxiety groups prevented the use of analysis of variance procedures to test for differences in group means on the three learning tasks. Since it is not unreasonable to assume that CA and MA are related to performance, differences in performance between anxiety groups could be related to differences in CA and MA rather than differences in manifest anxiety level. Attempts to adjust group means for differences in CA and MA by analysis of covariance procedures were not successful. The majority of the results obtained when analysis of covariance procedures were employed can not be interpreted due to the failure to meet the assumption of parallel regression lines. The assumption of parallel regression line slopes was met only for trial 4 and the composite gain score of the Concept Identification Task.

High and low anxiety groups, contrary to certain postulates derived from Hull-Spence theory and empirical evidence, did not differ in mean performance on trial 4 of the Concept Identification Task. However, the low anxiety group obtained a significantly higher mean Concept Identification Task gain score than the high anxiety group.

The two group comparisons that can be interpreted are inconsistent. The Concept Identification Task was selected as a difficult task with many competing response alternatives, a situation in which the low anxiety group should be superior to the high anxiety group (Spence, 1958, pp. 131-141; Taylor, 1956, pp. 303-320). The results obtained from the Concept Identification Task gain score are consistent with predictions derived from Hull-Spence Theory. The gain score results are also consistent with earlier studies employing a task similar to the one used in this study (Lipman and Griffith, 1960, pp. 342-348) and employing a different task (Hall, 1959, pp. 36-37). The failure to obtain similar results on trial 4 can not be readily explained due to the inability to interpret the findings relative to other trials and other tasks.

It is of some interest to note that the tests of differences in gain scores between anxiety groups for the Object Assembly and Digit Substitution Tasks produced results that would have been significant had the underlying assumption of parallel regression lines been achieved. However, based upon the assumed number of competing response alternatives involved in the Object Assembly and Digit Substitution Tasks, the results would have been opposite to predictions. The inconsistency could have been the result of either an incorrect assessment of task difficulty or an error in the Hull-Spence theoretical formulation. Moreover, had the results been interpretable, the findings would have supported Taylor's (1956, p. 306) hypothesis that subjects who score high on the manifest anxiety scale react emotionally in a persistent manner to all situations. The findings would not have supported the alternate hypothesis that subjects who score high on the anxiety scale have a lower threshold of emotional responsiveness and react with an emotional response only in situations containing some degree of stress.

It is of interest to note that the variability in variance found among the twelve experimental groups could not be assigned to either the high or the low anxiety group. However, the collapse of the anxiety groupings reduced the heterogeneity of variance. Edwards (1962, p. 110) has noted that heterogeneity of variance frequently is associated with the differential operation of a given treatment upon differences in an organismic variable. Inspection of the anxiety x sex x treatment cells suggests the possibility that the heterogeneity of variance found in the present study may be associated with the different effects of the encouraging treatment and neutral treatment on male and female subjects in the high and low anxiety groups.

The findings of the present investigation are inconsistent and do not provide the evidence necessary to answer the second question posed by this investigation. Additional investigation, either with anxiety groups not differing in CA and MA or with such differences statistically controlled, will be necessary to test the significance of differences in mean performance on the experimental tasks relative to anxiety groupings. The findings suggest that the anxiety variable may be a factor in the performance of mentally retarded subjects. However, the inconsistent results of this investigation and other investigations (Cantor, 1963, pp. 127-129; Steigman, 1962, pp. 70-72) suggest that methodological problems associated with the selection of extreme anxiety groups must be solved if the relationship between anxiety level and performance is to be examined and understood. It may be that the failure to adhere to the suggestion offered by Pryer and Cassel (1962, p. 860) and exclude subjects with mental ages below eight years, rather than the seven years employed in the present study, contributed to the finding of significant differences in mean CA and MA between anxiety groups. Anxiety groups matched on CA and MA could be employed if the original population was of sufficient size to obtain the desired number of subjects. The null hypothesis of no difference in performance on the experimental tasks as a result of the manifest anxiety level of the subject has not been rejected, supported, or adequately tested by the present investigation.

Question 3. Are there differences in performance on the experimental task related to the sex of the subject?

The hypothesis of no difference in performance on the experimental tasks between the sexes received partial support in this study. No differences in performance were found between boys and girls on the Digit Substitution or the Concept Identification Tasks. The heterogeneity of variance found among the twelve experimental groups cautions against reaching the same conclusion for the Object Assembly Task. However, when the anxiety classification was discarded and the subjects were reassigned to sex and treatment groups, the finding of no sex differences can be stated for trial 4 and the composite gain score of the Object Assembly Task. Since the sexes did not differ in CA and MA, analysis of variance procedures could be applied to test for differences in mean performance between sex groups.

The trend of performance means over the learning trials did not differ for the sexes on either the Digit Substitution Task or the Concept Identification Task. The learning curves of boys and girls on the two tasks were of the same form and were essentially linear. Statements concerning the trend of the mean performance of boys and girls over the five trials of the Object Assembly Task must be made with less assurance. However, the learning curves of the sexes on the Object Assembly Task were essentially linear and of the same form. Based upon the findings of this study, it can be stated that both boys and girls showed a significant improvement in performance with practice on the three learning tasks.

The finding of no difference in performance between boys and girls on the Concept Identification Task supports a similar finding reported by Lipman and Griffith (1960, pp. 342-348) employing a similar task. Johnson and Blake (1960, pp. 16-33), from whom the Digit Substitution Task and Object Assembly Task were adapted, employed male and female mentally retarded subjects but failed to report sex comparisons.

It is of interest to note that the variability in variance found among the twelve experimental groups could not be assigned to either the male or the female groups. The collapse of the anxiety groupings and realignment of subjects into sex and treatment groups resulted in a reduction in the heterogeneity of variance. Inspection of the six resulting sex and treatment groups suggests that the heterogeneity of variance found among the experimental groups for the Object Assembly Task may be associated with the high variability of the female subjects. No clearly discernable pattern was found for the other two tasks.

The findings of the present study provide the evidence necessary to answer the third question posed by this investigation. For the experimental population, there are no differences in performance on the experimental tasks related to the sex of the subject.

Question 4. Are there differences in performance on the experimental tasks related to the complexity of the learning tasks?

The hypothesis of no differences in performance on the experimental tasks as a function of task complexity cannot be directly tested by the present study. The experimental design included assumptions relative to the complexity of the three learning tasks but did not include a method by which direct comparisons could be made. Reference to Section E, Chapter II will show that the three tasks were ordered in terms of increasing complexity from Object Assembly to Digit Substitution to Concept Identification. The complexity assigned to each task was based upon the subjective assessment of the competing response alternatives associated with each task.

The evidence necessary to answer Question 4 would have been related to the anxiety variable and the answers to the 1st and 5th Questions posed by this study. Since mean performance on the experimental tasks related to anxiety groups could not be interpreted due to significant group differences in CA and MA and the inability to control for these differences, the information necessary to answer Question 4 is not available.

Based upon Hull-Spence Theory (Spence, 1958, pp. 131-141; Taylor, 1956, pp. 303-320) and empirical evidence (Castaneda, Palermo and McCandless, 1956, pp. 327-332; Hall, 1959, pp. 36-37; Lipman and Griffith, 1960, pp. 342-348; Palermo, Castaneda and McCandless, 1956, pp. 333-337), low anxious subjects should be superior to high anxious subjects on tasks containing many response alternatives and high anxious subjects should be superior to low anxious subjects on tasks containing few response alternatives. Some support for the superiority of low anxiety subjects on a task involving many competing response alternatives is provided by the finding that low anxiety subjects were superior to high anxiety subjects in Concept Identification gain score. However, results contrary to predictions would have been found for the other learning tasks if the underlying assumptions required for statistical analysis had been achieved, i.e., low anxiety subjects superior to high anxiety subjects in Object Assembly gain score and high anxiety subjects superior to low anxiety subjects in Digit Substitution gain scores. The apparent contradiction could have been the result of either an error in the assumptions related to the relative complexity of the two learning tasks or an error in the Hull-Spence theoretical schema.

Differences were found between means of successive trials for each of the three learning tasks. That is to say, the mentally retarded subjects employed in this study showed a significant amount of improvement with practice or learning on the three learning tasks. It would seem that the findings of the present study suggest that the three learning tasks have value as experimental tasks for use with mentally retarded subjects. However, the relative difficulty level in terms of response alternatives remains unknown. The results of the study suggest the possibility that the order of difficulty, from least to most, should be Digit Substitution, Object Assembly, and Concept Identification respectively. The actual level of difficulty assigned to the experimental tasks must await additional investigation.

Question 5. Are there differences in performance on the experimental tasks related to the interaction of one or more of the independent variables?

Isolated differences in performance were found for two of the experimental tasks related to the interaction of one or more of the independent variables, namely Digit Substitution and Concept Identification. No differences in performance related to the interactions of one or more of the independent variables were found for the Object Assembly Task.

The learning curve related to treatment conditions differed for boys and girls on both the Digit Substitution and the Concept Identification Tasks. Mentally retarded boys who received the encouraging verbal treatment (E) began with a higher mean performance and maintained their superiority relative to boys under the other treatment conditions on both the Digit Substitution and Concept Identification Tasks. The relative position of the mentally retarded boys who received the discouraging verbal treatment (D) and neutral treatment (N) was different for the two tasks. On the Digit Substitution Task, the N group began with a higher mean score and maintained their superiority over the D group. However, the relative superiority of the D and N groups was reversed on the Concept Identification Task.

The initial relative position of mentally retarded girls assigned to the three treatment groups was identical to the boys on the Digit Substitution Task. However, the female D group overcame the initial superiority of the E and N groups by the third trial and maintained their superiority on the remaining trials. The E group finished in second position. The N group began in second position but finished in last position. On the Concept Identification Task, the girls assigned to the N group began with a higher mean performance than the girls assigned to the other treatment groups. The mentally retarded girls in the N group maintained their superiority over the six learning trials. The E and D groups were second and third respectively on the first trial and remained in the same relative position over the remaining five trials.

Some evidence exists to suggest that the different treatment effects for the sexes on the Concept Identification Task may be due to differences that occurred on the last three trials of the task. Although the assumptions required for analysis of covariance were not met for trials 5 and 6, a sex x treatment interaction was found for trials 4, 5, and 6. Only the data for trial 4 met the assumption of parallel regression slopes. The failure to achieve the underlying assumption prevents interpreting the results beyond the isolated interaction reported for trial 4.

When performance on the Digit Substitution and Concept Identification Tasks was converted to gain scores, mean gain scores for mentally retarded boys and girls differed relative to treatment conditions. The sex x treatment interactions for mean gain scores were of the same form as found for the learning curves plotted for treatment groups for boys and for girls. The mentally retarded boys who were under the E condition obtained a higher mean gain score than retarded boys under either the N or D conditions. The superiority of the male E group was found for both the Digit Substitution Task and the Concept Identification Task. The retarded male subjects under the D condition were inferior to boys under the N condition on the Digit Substitution Task. However, the positions of the D and N group were reversed for the Concept Identification Task. Mentally retarded boys under the D condition were superior in mean Concept Identification gain score to retarded boys under the N condition.

Mentally retarded girls under the E condition were inferior in mean Digit Substitution Task gain score to retarded girls under either of the other two experimental conditions. The highest performance was recorded for retarded girls under the D condition. A different pattern was found for the Concept Identification Task. Mentally retarded girls under the N condition were superior in mean gain score to girls under either of the other two experimental conditions. The lowest mean Concept Identification Task gain score was recorded for retarded girls under the D condition.

The finding of significant differences in performance on two of the experimental tasks resulting from different effects of the treatment conditions for the two sexes, contrary to expectancy theory and empirical evidence, is to be noted. Earlier studies either failed to investigate the differential effects of performance expectations on male and female subjects (Tyler, 1958, pp. 166-172; Ellis and Distefano, Jr., 1959, pp. 486-490), employed only subjects of one sex (Aronson and Carlsmith, 1962, pp. 178-192; Ward and Sandwald, 1963, pp. 293-295), or failed to find significant differences (Blackman and Kahn, 1963, pp. 751-757). It is to be noted that only the mentally retarded male subjects on the Digit Substitution Task performed consistently with predictions derived from expectancy theory (Cromwell, 1963, pp. 41-91). Other comparisons produced results inconsistent with or opposite to predictions. Male subjects were closest to predictions on both learning tasks. The performance of female subjects was opposite to predictions on the Digit Substitution Task and inconsistent on the Concept Identification Task. It may well be that male mentally retarded subjects react differently to demands for performance than female mentally retarded subjects and that such differences may be related to the complexity of the task.

A few isolated interactions were found that involved the anxiety variable. A similar situation to the one found for the sex x treatment interaction was found for the sex x anxiety interaction for trials 4, 5, and 6 of the Concept Identification Task. Only the data obtained for trial 4 met the assumption of parallel regression lines required for analysis of covariance procedures. The significant sex x anxiety interactions found for trials 5 and 6 and the significant sex x anxiety first order interaction can not be interpreted. On trial 4 of the Concept Identification Task, high anxiety mentally retarded girls, contrary to Hull-Spence theory and empirical evidence, obtained a higher mean Concept Identification score than retarded girls assigned to the low anxiety group. The opposite results, consistent with Hull-Spence theory and empirical evidence, occurred for mentally retarded boys. Boys assigned to the low anxiety group obtained higher Concept Identification scores on trial 4 than boys assigned to the high anxiety group. A similar form was found for trials 5 and 6 and the first order interaction but cannot be interpreted statistically due to the failure to achieve the required assumptions or to control for group differences in CA and MA.

The one significant sex x anxiety interaction was opposite to the results of an earlier investigation employing a similar task (Lipman and Griffith, 1960, pp. 342-348). Other investigations have reported contradictory results regarding differential effects of anxiety for boys and girls (Keller and Rowley, 1962, pp. 19-22; Phillips, 1962, pp. 316-322). The isolated results from one trial of one experimental task cannot be interpreted beyond the single isolated instance in which it occurred. The question of differential effects of high and low anxiety for mentally retarded boys and girls has not been answered by the present investigation.

One significant triple order interaction was found for sex x anxiety x treatment for the Concept Identification Task gain score. The highest mean gain score was recorded for low anxiety mentally retarded boys assigned to the E condition. Low anxiety boys assigned to the E and N conditions obtained higher mean gain scores than high anxiety boys obtained under any one of the three treatment conditions. Mean gain scores obtained by low anxiety boys in order of decreasing magnitude were obtained under condition E, N, and D respectively. High anxiety mentally retarded boys under the D condition obtained a higher mean gain score than high anxiety boys assigned to either of the other two conditions. Mean gain scores obtained by high anxiety boys in order of decreasing magnitude were obtained under conditions D, E, and N. The mentally retarded, high anxiety boys under condition D obtained a higher mean gain score than the mentally retarded, low anxiety boys under the same condition. Only under condition D were high anxiety boys superior to low anxiety boys on Concept Identification gain score.

The form of the anxiety x treatment interaction was different for mentally retarded girls than for mentally retarded boys. The highest mean Concept Identification gain scores were obtained by low anxiety, female mentally retarded subjects and high anxiety, female retarded subjects under the N condition. The low anxiety group was superior to the high anxiety group by only a few points. The lowest mean gain scores were obtained by the high anxiety and low anxiety groups respectively under the D condition. Intermediate mean gain scores were obtained by the high and low anxiety groups under the E condition, high anxiety female subjects being superior to low anxiety female subjects.

The anxiety x treatment interaction obtained by male mentally retarded subjects for Concept Identification gain scores is partially consistent with Hull-Spence theory (Spence, 1958, pp. 131-141; Taylor, 1956, pp. 303-320). The results support the hypothesis that subjects who score high on the anxiety scale have a lower threshold of emotional responsiveness and react with an emotional response only in situations containing some degree of stress (Taylor, 1956, p. 306). Within Hull-Spence theory, the E condition could be interpreted as stress producing, hence, detrimental to the performance of high anxiety subjects on a task containing a number of response alternatives. No differences in performance would be expected between anxiety groups under the N and D conditions. However, the finding of higher mean performance for low anxiety mentally retarded boys under conditions E and N than for high anxiety boys under the same conditions is consistent with other studies employing nonretarded subjects (Sarason, 1961. pp. 165-168; Sarason, 1962, pp. 23-33; Sarason, Mandler and Craighill, 1952, pp. 561-565).

The pattern obtained by mentally retarded female subjects is inconsistent with Hull-Spence theory and empirical evidence and with the results obtained by the mentally retarded male subjects employed in the present study. The failure to obtain significant triple factor interaction for other data obtained from the three experimental learning tasks prevents interpreting the one significant interaction beyond the single isolated situation in which it occurred.

The significant interactions found among the independent variables do not provide the evidence required to answer the fifth question posed by this investigation. It would seem that sufficient evidence exists to suggest the need for additional investigations employing the three independent variables. A more careful selection of high and low anxiety groups, matched on CA and MA, is necessary to evaluate the effects of manifest anxiety in isolation and in interaction with other variables on selected learning tasks. The single triple order interaction obtained (anxiety x sex x treatment) suggests that an investigation with more discreet measurement may provide the evidence required to test Johnson's hypothesis related to the "paradox" of the special class (Johnson, 1962, pp. 62-69).

Support for Johnson's hypothesis would have been provided by the finding of a strong anxiety x treatment interaction on the three experimental tasks. The limited findings of this investigation provide some evidence supporting Johnson's (1962, pp. 67-69) hypothesis that (a) a reduction in anxiety level resulting from (b) a reduction or elimination of the pressures (stress) created by realistic demands for performance (c) results in a reduction in learning. However, the findings of this study tend to provide support for the hypothesis with male mentally retarded subjects only. Moreover, this conclusion is qualified by noting that it is based on only a few isolated group comparisons in which the assumptions underlying the statistical treatment were achieved.

2. Summary of Discussion

The findings of this study do not support broad generalizations. Two of the five questions posed by the investigation could not be answered due to significant group differences in CA and MA that could not be statistically controlled. The failure to control for group differences also limited the results available to answer a third question posed by the study. The results suggest that in both a paired associates task involving rote learning of stimulus-response associations and motor dexterity, and an abstraction task involving the identification of a similarity among sets of words, the performance of mentally retarded boys and girls may be influenced by verbal statements involving performance expectations. Some evidence was found to suggest that performance on the Digit Substitution Task and the Concept Identification Task was influenced by the manifest anxiety level of the subjects, the particular combination of anxiety level and sex, and the particular combination of anxiety level, sex, and verbal treatment. This conclusion is qualified by noting that it is based on only a few isolated group comparisons in which the assumptions underlying the statistical treatment were achieved. Evidence indicated no differences in mean performance related solely to the sex of the subject or solely to the treatment conditions. Evidence was found to support the selection of the three learning tasks as experimental tasks suitable to the study of changes in performance with practice employing mentally retarded subjects. Variability of performance was noted for the Object

Assembly Task but not for the Digit Substitution Task or the Concept Identification Task. The results suggest that the gain score may be a more sensitive index of change in performance than raw scores plotted over a series of learning trials.

Speculations were made based on the integration of the findings with research and theory. A number of suggestions for future investigation were presented. The failure of the present study to adequately accomplish the initial purpose of the investigation was discussed.

V. SUMMARY AND CONCLUSIONS

This study was designed to investigate the influence of verbally mediated statements of performance expectations delivered by an authority figure on the performance of educable mentally retarded children of high and low manifest anxiety on three selected learning tasks. Verbal statements designed to produce an expectancy of success and an expectancy of failure were employed. A neutral treatment, devoid of verbal statements, was used to establish a neutral expectancy of neither success nor failure. Information was also sought concerning possible differences in performance between the sexes.

The Children's Manifest Anxiety Scale was orally administered to a population of 339 educable mentally retarded children. The children had no known motor and/or sensory dysfunctions, known emotional disturbances, or known lack of comprehension of the CMAS. From the upper and lower thirds of the distribution of anxiety scores, 72 retarded children, 36 boys and 36 girls, were randomly selected for inclusion in the study. Both the high and low anxiety groups consisted of 18 retarded boys and 18 retarded girls. These subjects were selected from classes for educable mentally retarded children located in Western Pennsylvania.

The 72 subjects were randomly assigned to the three performance expectation treatments. Random assignment to the three treatments was conducted separately for each sex group from each anxiety group. As a result of the random procedures employed, six boys and six girls from each of the high and low anxiety groups were assigned to each of the treatment conditions. In all there were twelve experimental groups of six subjects each.

To test the main effects of high anxiety subjects versus low anxiety subjects, boys versus girls, positive performance expectations versus neutral performance expectations versus negative performance expectations, and all interactions of these variables, three experimental tasks were used. The tasks were an Object Assembly Task, a Digit Substitution Task, and a Concept Identification Task. The Object Assembly and Digit Substitution Tasks were presented for five trials and the Concept Identification Task was presented for six trials. The tasks were selected as representing different types of learning and representing different degrees of difficulty.

Data from each task were evaluated by means of analysis of variance and analysis of covariance procedures. Analysis of covariance was employed due to the finding of significant differences in chronological age and mental age between high and low anxiety groups. The data included raw scores for each trial of each learning task. Gain scores calculated from the raw scores were obtained for each experimental task. The analyses were used to test for differences between the means of the twelve experimental groups, and to test all possible interactions. The assumptions underlying the statistical procedures employed were tested. The F max test for homogeneity of variance was applied to the data for each trial and the composite gain scores of each experimental task to evaluate the variability of performance. The F test was applied to the data for each trial and the composite gain scores of each experimental task to evaluate the differences in regression lines between the independent and dependent variables.

The first hypothesis stated that there would be no difference in performance on the experimental tasks as a function of the verbal statements of performance expectations delivered by an authority figure. The hypothesis was supported.

The second hypothesis stated that there would be no difference in performance on the experimental tasks as a function of the manifest anxiety level of the subject. The hypothesis could not be tested because the assumptions underlying the statistical procedures employed were not achieved for the majority of the group comparisons. The two comparisons that were possible provided contradictory results. Low anxiety subjects performed at a significantly higher level on the Concept Identification Task gain score than did the high anxiety group. However, no difference in performance was found between high and low anxiety subjects on trial 4 of the Concept Identification Task.

The third hypothesis stated that there would be no difference in performance on the experimental tasks as a function of the sex of the subject. The hypothesis was supported.

The fourth hypothesis stated that there would be no difference in performance of the experimental tasks as a function of the complexity of the task. The hypothesis could not be tested. The test of this hypotheses was related to the findings relative to the second hypothesis and parts of the fifth hypothesis posed by the study. The test of this hypothesis was based upon predictions derived from Hull-Spence theory relative to the performance of high and low anxiety subjects on the three tasks.

The fifth hypothesis stated that there would be no difference in performance on the experimental tasks as a function of the interactions among manifest anxiety level, verbal statements of performance expectations delivered by an authority figure, and the sex of the subject. The hypothesis was partially supported, partially rejected, but could not be fully tested. The methodological problems encountered with the anxiety variable prevented the full testing of the fifth hypothesis. However, certain group comparisons could be made. The trends of the performance means for the three treatment conditions on the Digit Substitution and Concept Identification Tasks differed significantly for the two sexes. A similar finding was obtained for the composite gain scores obtained for the two tasks. Significant differences in mean gain scores for the three treatment groups on the Digit Substitution and Concept Identification Tasks were obtained between boys and girls. Two of the interactions involving the anxiety variable were significant and met the assumptions underlying the statistical procedures. Concept Identification scores obtained by high and low anxiety groups on trial 4 of the task differed significantly between boys and girls. High and low anxiety, mentally retarded boys and girls differed significantly on mean Concept Identification gain scores obtained under the encouraging, discouraging, and neutral treatments. No other significant interactions were found that also met the assumptions underlying the statistical procedures employed.

Speculations related to the findings were stated in terms of theory and related research. These speculations were qualified, as they pertained to differences in performance between the two anxiety groups, due to the limited comparisons that could be made. The majority of the data relative to anxiety groups could not be interpreted due to methodological problems. Suggestions were offered relative to the need for and use of the anxiety variable in research on learning employing educable mentally retarded children.

The findings relative to performance expectations conditions suggested that the performance of mentally retarded children on the experimental tasks may have been related to the sex of the subject. Meager evidence was found to suggest that anxiety level may also be a related factor.

This investigation suggested that broad generalizations related to the performance of educable mentally retarded children on selected learning tasks were probably not warranted. Methodological problems associated with the anxiety variable prevented the testing of two hypotheses and a portion of a third hypothesis of the five hypotheses to be tested by the investigation. The conclusions that were reached were qualified by the limited group comparisons upon which they were based. Further investigation of these variables, employing improved design and procedures, should be fruitful.

APPENDICES

APPENDIX A

PERSONAL DATA, EXPERIMENTAL GROUPS, TASK ADMINISTRATION ORDER, AND SCORES ON THE EXPERIMENTAL TASKS FOR ALL 72 SUBJECTS

Subject	Task Order	Anxiety Group	Sex	CA	MA	IQ	A Score	L Score	Unsolvable Problem	Digit Substitution		
										Trial 1	Trial 2	Trial 3
1	BCA	HA	M	181	112	65	27	6	43.7	20	18	25
2	BCA	HA	M	166	97	63	27	4	214.2	28	29	36
3	ABC	HA	M	190	98	55	26	6	47.8	10	12	9
4	ACB	HA	M	178	130	76	37	4	64.1	20	20	20
5	ACB	HA	M	130	99	76	30	2	112.3	19	23	29
6	CBA	HA	M	144	100	72	31	5	36.4	22	24	29
7	ACB	HA	M	162	116	73	35	2	183.8	25	23	23
8	BCA	HA	M	195	107	59	30	7	189.2	25	27	37
9	BCA	HA	M	200	106	56	27	6	183.4	21	22	27
10	CBA	HA	M	139	102	75	31	5	300.0	14	13	15
11	BCA	HA	M	157	122	78	31	7	106.1	14	19	22
12	BAC	HA	M	148	113	78	29	7	182.3	12	12	14
13	CBA	HA	M	151	106	73	28	5	127.4	11	16	19
14	ABC	HA	M	141	106	76	29	1	86.2	18	20	22
15	BAC	HA	M	139	93	67	31	4	183.6	18	17	16
16	ACB	HA	M	216	130	72	25	3	240.6	10	17	18
17	BCA	HA	M	178	117	70	25	0	211.2	28	27	30
18	CBA	HA	M	130	94	73	25	7	132.9	10	14	13
19	CBA	HA	F	153	114	76	26	3	182.5	24	28	28
20	CBA	HA	F	183	130	75	29	6	128.3	26	25	24
21	BAC	HA	F	141	86	61	34	6	31.5	18	12	18
22	CBA	HA	F	174	98	61	32	1	58.8	21	29	31
23	BCA	HA	F	196	139	75	29	5	180.0	27	28	32
24	CAB	HA	F	151	114	76	25	1	183.1	21	19	18

APPENDIX A (Continued)

Subject (Continued)	Digit Substitution (Continued)			Object Assembly					
	Trial 4	Trial 6	Gain Score	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Gain Score
1	24	29	16	115.1	69.2	66.6	54.1	55.4	-215.1
2	32	38	23	78.7	57.1	51.1	54.4	46.8	-105.4
3	10	12	3	82.3	73.4	71.8	64.8	61.4	-57.8
4	21	20	1	91.7	87.1	73.0	90.7	76.4	-39.6
5	25	28	29	91.5	77.5	67.8	60.6	70.7	-89.4
6	28	26	19	105.8	75.7	68.1	58.9	55.4	-165.1
7	18	24	-12	86.5	79.2	69.1	69.0	92.7	-36.0
8	40	47	51	116.1	73.5	53.8	60.8	42.7	-233.6
9	31	30	26	89.7	77.1	67.3	62.3	88.8	-63.3
10	13	16	1	98.1	66.3	55.7	54.8	60.8	-154.8
11	21	17	23	60.1	68.2	56.1	53.1	53.2	-9.8
12	14	16	8	75.9	81.7	79.2	90.2	109.5	+57.0
13	18	17	26	61.2	51.2	55.5	48.8	56.1	-33.2
14	19	26	15	54.1	48.7	40.3	42.7	42.7	-42.0
15	18	18	-3	84.2	65.8	64.9	105.7	80.0	-20.4
16	19	19	33	41.5	44.7	35.7	40.0	34.3	-11.3
17	26	29	0	63.9	60.6	59.8	70.6	59.1	-5.5
18	19	17	23	141.5	116.4	137.4	102.7	61.1	-148.4
19	29	34	23	89.4	63.5	57.1	64.4	47.7	-124.9
20	24	31	0	50.7	64.2	51.1	51.2	38.7	+2.4
21	19	20	-3	140.1	117.7	109.7	106.4	111.8	-114.8
22	29	34	39	188.1	130.7	99.4	146.4	71.7	-304.2
23	30	32	14	69.8	63.4	59.4	55.2	53.2	-48.0
24	23	24	0	110.2	82.8	74.2	54.5	56.4	-172.9

APPENDIX A (Continued)

Subject (Continued)	Concept Identification							Experimental Group
	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Gain Score	
1	3	4	4	4	4	4	5	A
2	7	8	8	8	8	8	5	A
3	0	0	0	0	0	0	0	A
4	0	0	1	1	1	1	4	A
5	2	4	4	4	4	4	10	A
6	4	3	3	5	5	5	1	A
7	2	2	2	2	2	2	0	B
8	3	4	4	4	3	4	4	B
9	0	0	0	2	3	4	9	B
10	5	4	4	2	3	1	-11	B
11	4	4	4	5	5	5	3	B
12	5	8	8	8	8	8	15	B
13	5	6	6	6	7	7	7	C
14	3	4	6	6	6	6	13	C
15	1	2	2	2	3	3	7	C
16	4	6	6	6	7	8	13	C
17	5	6	6	6	6	5	4	C
18	2	4	2	2	2	2	2	C
19	4	4	4	4	5	5	2	D
20	5	5	5	6	6	6	3	D
21	0	0	2	2	2	2	8	D
22	0	0	2	2	2	2	8	D
23	7	8	8	8	8	8	5	D
24	2	3	4	4	6	5	12	D

APPENDIX A (Continued)

										Digit Substitution		
Subject	Task Order	Anxiety Group	Sex	CA	MA	IQ	A Score	L Score	Unsolvable Problem	Trial 1	Trial 2	Trial 3
25	BCA	HA	F	158	114	73	26	6	58.9	22	22	24
26	ACB	HA	F	165	111	69	28	1	87.1	21	21	22
27	CBA	HA	F	199	134	72	29	5	128.1	24	30	27
28	ABC	HA	F	158	88	56	28	3	126.8	13	16	18
29	ABC	HA	F	216	112	62	29	0	104.8	24	29	30
30	BAC	HA	F	190	116	65	25	6	178.1	26	32	28
31	CAB	HA	F	131	101	77	37	6	133.5	15	15	19
32	ACB	HA	F	223	110	61	26	7	183.5	16	23	27
33	BCA	HA	F	117	84	70	30	6	128.2	9	11	12
34	BAC	HA	F	155	97	66	25	4	183.9	21	19	19
35	ABC	HA	F	132	84	64	31	6	52.8	23	25	31
36	ABC	HA	F	183	130	75	32	5	133.6	17	21	28
37	CBA	LA	M	190	128	72	13	1	183.8	26	27	31
38	ACB	LA	M	191	123	67	10	6	184.6	26	30	27
39	CAB	LA	M	182	135	78	8	5	114.4	22	26	25
40	CAB	LA	M	184	113	65	3	6	132.4	21	25	25
41	BCA	LA	M	196	143	77	14	3	58.8	23	28	23
42	ABC	LA	M	178	123	72	16	6	107.0	28	33	37
43	BAC	LA	M	181	121	71	16	4	125.7	22	21	27
44	BAC	LA	M	175	125	74	13	3	43.0	24	22	22
45	ACB	LA	M	172	130	79	14	7	182.8	28	22	24
46	CAB	LA	M	181	108	64	15	2	182.2	29	32	42
47	CAB	LA	M	194	101	56	5	6	104.4	24	26	29
48	CAB	LA	M	187	123	69	13	5	124.8	24	22	22

APPENDIX A (Continued)

Subject (Continued)	Digit Substitution (Continued)			Object Assembly					
	Trial 4	Trial 5	Gain Score	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Gain Score
25	12	24	-6	116.1	73.0	63.3	61.2	65.1	-201.8
26	21	21	1	110.5	79.7	77.6	64.6	75.6	-144.5
27	32	32	25	91.8	76.3	64.8	65.3	56.6	-104.2
28	11	19	12	78.8	64.0	45.0	48.4	48.8	-109.0
29	29	30	22	79.5	69.4	58.8	60.5	56.6	-72.7
30	30	27	13	107.7	71.7	64.5	66.0	60.8	-167.8
31	17	19	10	70.6	65.8	53.3	70.2	54.2	-38.9
32	25	30	41	95.8	86.2	72.5	73.0	70.4	-81.1
33	12	12	11	234.4	193.4	153.9	125.7	122.0	-342.6
34	33	34	21	91.2	65.5	62.6	65.2	51.4	-120.1
35	36	32	32	91.1	86.7	103.5	68.9	59.1	-46.2
36	26	29	36	73.6	66.9	86.6	66.3	51.4	-23.2
37	34	34	21	119.5	66.6	71.5	53.9	68.6	-217.4
38	27	32	12	59.5	79.4	57.2	45.8	52.5	-3.1
39	29	31	23	72.7	62.5	46.2	98.1	55.4	-28.6
40	27	30	23	180.0	99.4	97.4	78.0	76.9	-368.3
41	31	32	22	62.4	56.9	51.5	57.9	52.0	-31.3
42	37	40	35	92.0	67.0	66.8	59.1	58.4	-116.7
43	28	32	20	57.3	62.8	49.8	42.7	61.0	-12.9
44	26	23	-3	54.1	101.3	54.1	45.5	49.2	+33.7
45	29	28	-9	59.5	49.0	47.9	56.0	51.6	-33.5
46	34	40	32	61.9	59.7	52.5	50.7	52.6	-32.1
47	28	26	13	83.5	63.0	65.3	72.0	67.6	-66.1
48	19	26	-7	71.3	57.5	55.2	53.1	48.1	-71.3

APPENDIX A (Continued)

Subject (Continued)	Concept Identification							Experimental Group
	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Gain Score	
25	6	7	7	8	8	8	8	E
26	4	4	5	5	5	5	4	E
27	6	6	6	5	8	8	3	E
28	0	0	2	7	7	7	23	E
29	3	5	4	6	6	6	12	E
30	5	6	6	7	7	7	8	E
31	0	0	0	0	0	0	0	F
32	2	2	2	2	2	2	0	F
33	0	0	0	0	0	0	0	F
34	4	4	4	4	4	4	0	F
35	3	2	3	4	4	4	2	F
36	6	6	6	6	6	7	1	F
37	5	5	6	7	7	8	8	G
38	6	6	6	7	8	8	5	G
39	6	8	8	8	8	8	10	G
40	1	6	6	6	6	7	26	G
41	6	8	8	8	8	8	10	G
42	3	6	8	8	8	8	23	G
43	2	4	4	4	5	5	12	H
44	2	3	4	4	4	4	9	H
45	4	5	6	6	6	6	9	H
46	3	5	5	5	5	5	10	H
47	3	3	3	3	3	3	0	H
48	4	5	6	6	6	6	9	H

APPENDIX A (Continued)

Subject	Task Order	Anxiety Group	Sex	CA	MA	IQ	A Score	L Score	Unsolvable Problem	Digit Substitution		
										Trial 1	Trial 2	Trial 3
49	BAC	LA	M	202	121	67	15	2	200.8	18	18	19
50	BCA	LA	M	157	114	75	14	5	183.1	17	17	18
51	CAB	LA	M	143	108	77	11	7	171.8	22	24	18
52	CBA	LA	M	187	129	73	9	7	185.5	23	24	19
53	BAC	LA	M	119	84	69	17	6	187.1	10	10	11
54	ABC	LA	M	186	137	78	13	6	109.3	29	32	36
55	CBA	LA	F	190	131	72	12	3	127.9	12	14	12
56	BAC	LA	F	205	108	60	15	7	132.1	24	25	26
57	BAC	LA	F	220	139	77	11	6	112.9	38	35	38
58	ABC	LA	F	190	106	59	13	7	28.5	27	25	29
59	CAB	LA	F	159	110	72	5	3	152.9	22	20	25
60	ACB	LA	F	149	107	72	17	4	183.7	22	24	20
61	BAC	LA	F	152	105	69	15	7	183.5	20	19	21
62	ABC	LA	F	150	98	68	5	3	125.8	10	12	8
63	BCA	LA	F	184	112	65	17	4	105.8	27	29	32
64	ACB	LA	F	156	97	66	14	7	74.1	24	26	24
65	CAB	LA	F	168	98	63	9	7	78.1	26	31	28
66	ACB	LA	F	153	91	63	17	5	104.5	16	15	18
67	BCA	LA	F	200	119	63	16	7	62.2	26	27	33
68	CBA	LA	F	159	101	64	9	7	129.9	26	27	29
69	ABC	LA	F	184	92	53	10	6	183.5	20	22	26
70	BAC	LA	F	207	132	73	14	2	129.5	31	36	38
71	ABC	LA	F	208	125	69	12	7	110.6	29	28	26
72	CAB	LA	F	203	119	66	13	6	58.1	15	19	18

APPENDIX A (Continued)

Subject (Continued)	Digit Substitution (Continued)			Object Assembly					
	Trial 4	Trial 5	Gain Score	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Gain Score
49	19	19	3	84.5	63.6	61.1	73.1	64.2	-76.0
50	17	21	5	118.6	79.8	51.5	51.8	57.3	-234.0
51	23	26	3	93.8	66.4	62.4	56.1	48.8	-141.5
52	24	20	-5	140.4	91.3	72.1	81.9	74.0	-242.3
53	10	13	4	188.6	165.4	108.4	83.1	105.4	-292.1
54	35	38	25	63.6	44.2	46.2	45.4	41.9	-76.7
55	15	17	10	93.5	71.3	62.1	61.4	60.8	-118.4
56	22	22	-1	88.7	78.2	63.7	70.3	75.8	-66.8
57	36	39	-4	92.9	63.9	53.1	58.0	53.5	-143.1
58	29	30	5	115.3	62.9	68.0	61.8	56.8	-211.7
59	22	24	3	283.2	165.2	111.3	89.4	105.0	-661.9
60	21	27	4	83.1	81.7	57.1	65.9	57.7	-70.0
61	19	21	0	80.3	75.7	69.4	75.3	73.2	-27.6
62	12	10	2	266.2	272.7	196.9	139.5	141.3	-314.4
63	31	35	19	117.6	68.1	66.0	60.1	67.3	-208.9
64	28	29	11	56.4	54.1	70.4	53.3	48.9	+1.1
65	23	29	7	108.5	68.4	67.1	66.3	66.9	-165.3
66	20	18	7	112.3	85.3	78.0	79.3	92.8	-113.8
67	30	32	18	62.5	50.4	50.1	40.5	39.0	-70.0
68	28	31	11	126.1	79.3	75.9	77.8	78.5	-192.9
69	25	26	19	97.9	66.3	71.3	63.8	69.7	-120.5
70	40	36	26	96.6	77.7	76.1	75.5	62.2	-94.9
71	32	33	3	70.3	53.2	49.7	61.8	47.2	-69.3
72	21	24	22	104.8	89.3	78.3	79.9	85.5	-85.7

APPENDIX A (Continued)

Subject (Continued)	Concept Identification							Experimantal Group
	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Gain Score	
49	6	7	7	7	8	8	7	I
50	4	6	6	7	7	7	13	I
51	3	4	4	4	4	4	5	I
52	4	4	3	4	3	3	-3	I
53	1	2	4	5	4	4	14	I
54	3	4	3	4	4	4	4	I
55	0	0	1	2	2	3	8	J
56	4	4	5	4	3	4	0	J
57	7	6	8	8	8	8	3	J
58	0	1	3	4	4	4	16	J
59	4	4	4	4	4	4	0	J
60	1	1	1	1	1	1	0	J
61	1	1	2	2	2	2	4	K
62	0	0	2	1	3	3	9	K
63	0	0	3	3	3	3	12	K
64	1	5	5	5	5	4	19	K
65	3	2	5	5	5	5	7	K
66	6	7	7	8	8	8	8	K
67	5	5	6	6	6	6	4	L
68	3	4	4	4	4	4	5	L
69	0	0	0	0	0	0	0	L
70	1	2	1	0	0	0	-2	L
71	4	4	4	5	5	4	2	L
72	0	0	3	4	4	4	15	L

APPENDIX B

CHILDREN'S MANIFEST ANXIETY SCALE

1. Instructions

Hello____________________, I am interested in finding out how boys and girls think and feel about things. I am going to ask you some questions that can be answered with either a yes or a no. There are no right or wrong answers to these questions, only how you think or feel about each one. I will read each question aloud while you follow on your answer sheet. Please listen very carefully and draw a circle around the yes or no answer at the end of each question. Please answer each question as honestly as you can. Your answers will not be seen by your teacher, ______________________, your parents, your classmates or anyone but me. If you do not fully understand the meaning of a question or a word, please tell me and I will tell you what it means. Are there any questions? - - - All right, here is the first question:

THE CHILDREN'S FORM OF THE MANIFEST ANXIETY SCALE

NAME ______________________________ SCHOOL ____________________

AGE __________ GRADE ______________ DATE ____________

DIRECTIONS: Read each question carefully. Put a circle around the word YES if you think it is true about you. Put a circle around the word NO if you think it is not true about you.

1. It is hard for me to keep my mind on anything .... YES NO
2. I get nervous when someone watches me work .... YES NO
3. I feel I have to be best in everything................ YES NO
4. I blush easily................................... YES NO
5. I like everyone I know .... YES NO
6. I notice my heart beats fast sometimes .... YES NO
7. At times I feel like shouting .... YES NO
8. I wish I could be very far from here .... YES NO
9. Others seem to do things easier than I can .... YES NO
10. I would rather win than lose in a game .... YES NO
11. I am secretly afraid of a lot of things .... YES NO
12. I feel that others do not like the way I do things ..... YES NO
13. I feel alone even when there are people around me .... YES NO
14. I have trouble making up my mind................... YES NO
15. I get nervous when things do not go the right way for me YES NO
16. I worry most of the time .... YES NO
17. I am always kind .... YES NO
18. I worry about what my parents will say to me......... YES NO
19. Often I have trouble getting my breath .... YES NO
20. I get angry easily .... YES NO
21. I always have good manners .... YES NO
22. My hands feel sweaty .... YES NO
23. I have to go to the toilet more than most people ...... YES NO
24. Other children are happier than I am .... YES NO
25. I worry about what other people think about me .... YES NO

26. I have trouble swallowing .... YES NO
27. I have worried about things that didn't really make a difference later .... YES NO
28. My feelings get hurt easily .... YES NO
29. I worry about doing the right things .... YES NO
30. I am always good .... YES NO
31. I worry about what is going to happen .... YES NO
32. It is hard for me to go to sleep at night .... YES NO
33. I worry about how well I am doing in school.......... YES NO
34. I am always nice to everyone .... YES NO
35. My feelings get hurt easily when I am scolded .... YES NO
36. I tell the truth every single time .... YES NO
37. I often get lonesome when I am with people .... YES NO
38. I feel someone will tell me I do things the wrong way . YES NO
39. I am afraid of the dark .... YES NO
40. It is hard for me to keep my mind on my school work .. YES NO
41. I never get angry .... YES NO
42. Often I feel sick in my stomach .... YES NO
43. I worry when I go to bed at night .... YES NO
44. I often do things I wish I had never done............. YES NO
45. I get headaches .... YES NO
46. I often worry about what could happen to my parents .. YES NO
47. I never say things I shouldn't .... YES NO
48. I get tired easily .... YES NO
49. It is good to get high grades in school .... YES NO
50. I have bad dreams .... YES NO
51. I am nervous .... YES NO
52. I never lie .... YES NO
53. I often worry about something bad happening to me.... YES NO

APPENDIX C

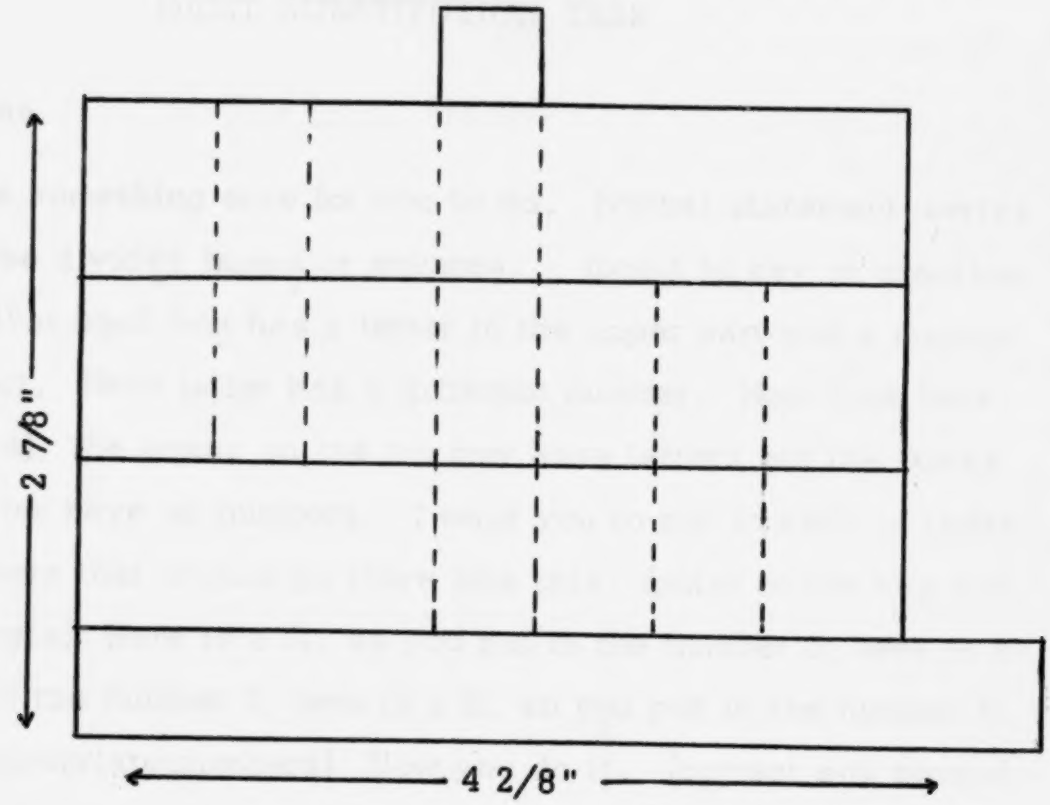
OBJECT ASSEMBLY TASK

1. Instructions

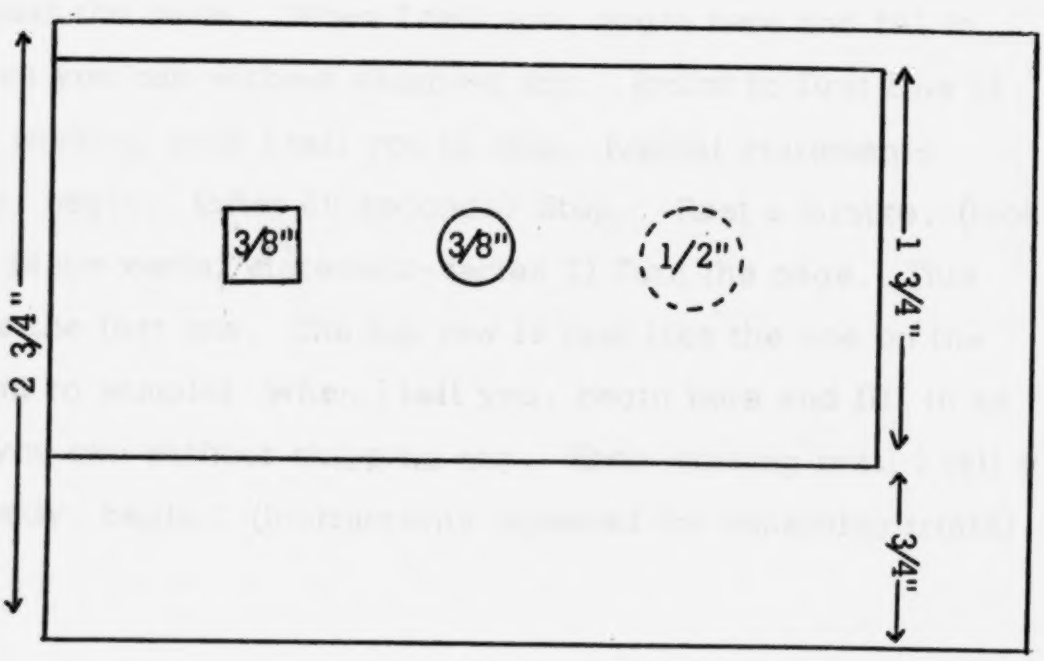
This is a wood puzzle. (one object assembly placed on table in front of S) (verbal statement-series 1) I want you to take it apart. Put the parts on the table in front of you. (help S disassemble the assembly unit if required) Good. The puzzle is put back together like this (demonstrate reassembly) You take it apart and then put it back together again. (repeat practice until S understands the task) I have four more puzzles just like the one you have in front of you. (four more assembly units placed on table) You now have five puzzles that are just alike, just the same. The object is to see how fast you can take the five puzzles completely apart and then put them back together again. I will time you with my watch so work as fast as you can. Remember, you are to take the five puzzles completely apart. As soon as you have all five completely apart you are to put them back together again. (verbal statement-series 1) Are you ready? . . . Begin (incomplete disassembly brought to S's attention for correction) (when S has completed the trial, look at stop watch and issue verbal statement-series 2) Now, I want you to take the puzzles apart again and then put them back together again. Remember, the object is to see how fast you can take the five puzzles completely apart and then put them back together again. Are you ready? . . . Begin. (instruction repeated for remaining trials)

2. The task

Side view:



Top view:


3/8"
3/8"
1/2"
2 3/4"
1 3/4"
3/4"

APPENDIX D

DIGIT SUBSTITUTION TASK

1. Instructions

I have something else for you to do. (verbal statement-series 1) Look at these divided boxes or squares. (point to key on practice page) Notice that each box has a letter in the upper part and a number in the lower part. Each letter has a different number. Now look here. (point to sample) The boxes on the top row have letters but the boxes on the bottom row have no numbers. I want you to put in each of these boxes the numbers that should go there like this. (point to the key and then to the sample) Here is a G, so you put in the number 3; here is an F, so you put in the number 5; here is a B, so you put in the number 9. (write in the appropriate numbers) Now you do it. (correct any errors) You're doing fine. Turn the page. Look at the top line. It is just the same as the one you saw on the first page. The numbers that go with the letters are just the same. When I tell you, begin here and fill in as many boxes as you can without skipping any. (point to first line of trial one) Keep working until I tell you to stop. (verbal statement-series 1) Ready, begin. (after 60 seconds) Stop. Rest a minute. (look at the page and issue verbal statement-series 2) Turn the page. This page is just like the last one. The top row is just like the one on the last page. (point to sample) When I tell you, begin here and fill in as many boxes as you can without skipping any. Keep working until I tell you to stop. Ready, begin. (instructions repeated for remaining trials)

THE DIGIT SUBSTITUTION TASK

Name ______________________ School ______________

Date ____________ Age ____ Teacher ______________

PRACTICE PAGE

A	B	C	D	E	F	G	H	I
2	9	4	1	7	5	3	8	6

G	F	B	A	C	I	H	F	D

STOP

DO NOT TURN THIS PAGE

A	B	C	D	E	F	G	H	I
2	9	4	1	7	5	3	8	6

A	E	C	H	I	A	B	H	E

B	H	B	A	G	C	F	H	D

G	H	D	C	D	E	G	H	D

D	F	I	E	B	C	G	A	F

B	C	D	A	F	H	C	H	F

H	I	A	D	B	C	I	D	E

F	G	E	A	I	D	C	A	H

H	F	A	G	H	C	A	F	B

B	F	D	G	C	B	F	I	G

STOP

DO NOT TURN THIS PAGE

Total ☐

A	B	C	D	E	F	G	H	I
2	9	4	1	7	5	3	8	6

B	F	D	G	A	F	G	C	I

I	C	D	B	G	F	E	B	H

G	A	H	D	F	H	D	G	F

B	H	I	E	D	I	B	C	H

G	H	A	B	I	A	F	D	B

E	A	B	H	E	I	A	D	H

F	D	I	A	I	E	B	C	G

I	A	C	F	D	I	H	G	D

F	A	D	B	H	I	E	B	H

STOP

DO NOT TURN THIS PAGE

Total ☐

A	B	C	D	E	F	G	H	I
2	9	4	1	7	5	3	8	6

E	A	H	G	I	H	B	C	D

D	E	F	D	G	A	I	D	B

F	E	I	E	H	C	B	I	F

F	E	H	I	B	F	I	A	C

B	D	H	G	I	E	I	C	H

A	B	E	H	F	C	F	G	F

D	I	D	G	B	H	C	F	D

B	A	C	A	F	E	I	B	D

D	G	E	H	A	I	C	A	G

STOP

Total ☐

DO NOT TURN THIS PAGE

A	B	C	D	E	F	G	H	I
2	9	4	1	7	5	3	8	6

D	H	I	A	C	G	D	F	C

G	A	B	G	H	E	G	F	I

F	D	A	C	H	B	H	I	B

C	F	D	F	E	A	B	G	H

B	D	C	F	I	G	E	D	B

I	E	B	D	F	H	A	D	F

B	D	A	E	A	G	C	D	H

C	H	B	I	G	F	E	H	B

D	I	A	C	G	D	B	H	F

STOP

DO NOT TURN THIS PAGE

Total ☐

A	B	C	D	E	F	G	H	I
2	9	4	1	7	5	3	8	6

D	I	A	H	F	G	H	B	C

H	A	D	E	B	E	C	G	F

E	D	B	A	D	I	F	H	C

I	B	I	C	A	G	E	G	H

F	A	C	E	B	I	D	B	A

H	D	F	A	B	G	D	H	E

C	I	A	H	E	H	F	G	I

F	A	H	E	A	B	G	B	E

D	I	A	H	B	H	C	F	E

Total ☐

END

APPENDIX E

CONCEPT IDENTIFICATION TASK

1. Instructions

I am going to say some words. I want you to tell me why the words go together, in what way they are the same. (verbal statement-series 1) I will put a card with three words on the table in front of you, like this. (place sample card on table) The three words are sugar, candy and cake. How are sugar, candy and cake just alike, just the same? . . . (if S says sweet) That's fine, all three are sweet. (if S gives the wrong answer, doesn't know or hesitates over 30 seconds) The answer is sweet. Sugar, candy and cake are all sweet. I'm going to say some more words. Each time I will put a card on the table with three words on it. Then I will read the three words out loud. You are to tell me how the words are the same, just alike. You will not have much time to answer so give your answer as quickly as you can. (verbal statement-series 1) We are now ready to begin. Here is the first card. (place first card on table in front of S) The words are ______, ______ and ______ . In what way are ______ , ______ and ______ the same, just alike? (permit maximum of 20 seconds for response, then remove the card) Here is the next card. (instructions repeated throughout remaining cards of trial 1) (at end of the trial) Rest a minute. (actually 30 seconds) (during the rest period E studies his answer sheet and issues verbal statement-series 2) Now we will try the same words again. The words will be the same as last time but mixed up. Here is the first card. (instructions repeated for remaining trials)

2. The Task

The concept identification task consisted of eight three-word sets. Two three-word sets were assigned to each of four concepts. Each three-word set was typed in capital letters on a blank 3" x 5" index card. The eight three-word sets were:

ball (01)-plate (02)-button (03); concept: round
wheel (13)-penny (14)-apple (15) concept: round
milk (04)-cigarette (05)-teeth (06); concept: white
snow (16)-egg (17)-chalk (18) concept: white
ocean (07)-truck (08)-skyscraper (09); concept: large, big
mountain (19)-airplane (20)-elephant (21) concept: large, big
pin (10)-kitten (11)-pea (12); concept: small, little
bug (22)-pill (23)-baby (24) concept: small, little

The order of presenting the three-word sets and the internal position of the words comprising the sets for the six trials were:

trial 1:
13, 14, 15
21, 20, 19
06, 05, 04
12, 10, 11
17, 16, 18
08, 09, 07
02, 01, 02
22, 23, 24

trial 2:
16, 17, 18
13, 14, 15
04, 05, 06
19, 20, 21
22, 23, 24
01, 02, 03
10, 11, 12
07, 08, 09

trial 3:
10, 11, 12
05, 06, 04
19, 21, 20
07, 08, 09
16, 18, 17
02, 01, 03
13, 15, 14
22, 24, 23

trial 4:
22, 24, 23
14, 13, 15
12, 10, 11
20, 19, 21
07, 08, 09
06, 04, 05
01, 03, 02
18, 16, 17

trial 5:
10, 12, 11
02, 01, 03
09, 07, 08
23, 22, 24
14, 13, 15
17, 18, 16
20, 19, 21
06, 04, 05

trial 6:
02, 01, 03
08, 07, 09
14, 13, 15
10, 11, 12
22, 23, 24
06, 05, 04
19, 21, 20
16, 18, 17

APPENDIX F

UNSOLVABLE PROBLEM

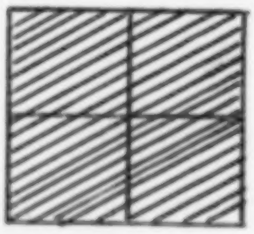
1. Instructions

Here is something I know you can do. Look at these four blocks. (Kohs blocks) They are just the same. One side is red, one is white, one is blue, one is yellow, one is red and white and one is yellow and blue. These four blocks can be put together to make a design like this. (Demonstration 1 from Wechsler-Bellvue Intelligence Scale, Form I constructed by E) Here are four more blocks. They are just like mine. (S given four more blocks) You make one just like mine. This should be easy for you. (errors corrected until S successfully completes the design) That's fine, I told you you could do it. Now, here's something I know you can't do. Here are four more blocks just like the ones on the table. Now you have twelve blocks. (blocks mixed up by E) Look at the design on this card. (design number 9 from the Wechsler Adult Intelligence Scale) I want you to try to make a design just like this one using all the blocks. I know you can't do it but I want you to try to make one just like this one anyway. (point to demonstration card) You may work on the design as long as you want to but you won't be able to make one just like this one. Ready, begin. (at the end of two minutes) I told you you couldn't do it. (at the end of three minutes) Do you want to give up? (at the end of five minutes or at an earlier point where S indicates he wants to give up) You tried hard but I told you you couldn't do it. Here is another one that I know you can do. (remove all but four of the blocks) Look at the design on this card. (design 3 from the Wechsler Adult Intelligence Scale) The four blocks can be put together to make a design just like this one (point to demonstration card) Begin. (point out errors and repeat until S is successful) That's fine, I told you you could do it.

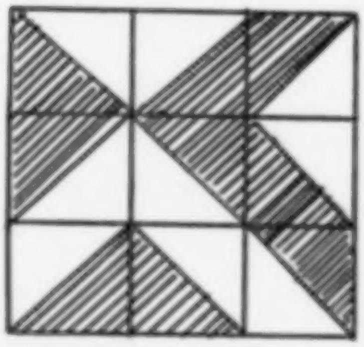
2. The Problems

Three block designs were used in the unsolvable problem. The unsolvable problem (problem 2) required the subject to construct a design of nine blocks using twelve blocks, an impossible task. The three designs employed were:

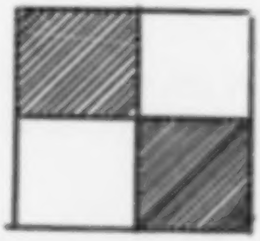
Problem 1:[1]



Problem 2:



Problem 3:



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[1] The areas with diagonal lines represent the color red, the areas without diagonal lines represent the color white.

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